# PRIDE Water Quality Assessment Report: Problems and Programs

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By

The Kentucky Water Resources Research Institute
University of Kentucky

For

PRIDE

# ABSTRACT

This report provides an overview of the water quality problems and associated state and federal programs in the 40 counties that make up the PRIDE region. The 2000 Kentucky 305(b) stream assessment has identified over 1000 miles of impaired stream within the region. The major cause of pollution in the region is related to problems with pathogens. Much of these problems are related to straight pipes and failing septic and wastewater systems. It has been estimated that there are over 35,000 straight pipes and failing septic systems in the PRIDE region. A second major environmental impact in the region is related to mining activities. However, because of the nature of the coal seams in eastern Kentucky, most of the impacts are related to siltation and habitat alteration as opposed to pH impairment. Most of the observed pH impairment is limited to McCreary and Whitley counties as a result of the more acidic coal bearing seems that occur in these counties. A third major problem in the PRIDE counties is related to solid waste. It is estimated that there are approximately 2000 illegal dumps in the PRIDE region.

Several federal programs have been implemented to deal with the significant environmental problems that exist in the PRIDE region. These include the NOAA supported PRIDE initiative along with the U.S. Army Corps of Engineers 531 program and site specific EPA earmarks. As of July 2000, total authorizations for all three programs exceeded 70 million dollars.

The efficient utilization of federal funds in improving the water quality and aquatic habitat of the region requires a mechanism for assessing and evaluating the impacts of proposed and ongoing projects as well as some mechanism for prioritizing the allocation of additional funds. An environmental problem metric proposed in this report provides a basic way to evaluate funding priorities in light of their potential impact on targeted problems. The companion report PRIDE Water Quality Assessment Report II: Chemical, Biological and Habitat Assessments provides a 10 year baseline assessment of environmental conditions in the region as measured by indicators of pH, fecal coliforms, habitat assessment, and macro-invertebrate assessment. This assessment should provide the basis for evaluating the long term impact of proposed and ongoing projects in the basin. Additional supplemental sampling locations for use in improving the overall project assessments are proposed and evaluated in the companion report PRIDE Water Quality Assessment Report III: Existing and Proposed Monitoring Network.

# INTRODUCTION

The PRIDE (Personal Responsibility in a Desirable Environment) initiative was first announced by U.S. Congressman Harold "Hal" Rogers and Natural Resources and Environmental Protection Cabinet Secretary James Bickford in 1997. PRIDE is the first comprehensive, region-wide, local/state/federal cooperative effort designed to address the serious challenge of cleaning up the region's rivers and streams. The initiative is focusing on 40 separate counties located in the southeastern part of Kentucky that form the headwaters for the Big Sandy, Licking, Kentucky, Green and Cumberland river basins. Also included in the region are small segments of the Salt and Little Sandy river basins (see Figure 1.1). Since it's formation in 1997, PRIDE has been responsible for the funding of numerous projects in the 40 PRIDE counties, many of which focus on the elimination of straight pipes and the upgrading of wastewater treatment plants. Since 1997, PRIDE and PRIDE-related projects have received almost $70,000,000 in federal funding and the PRIDE program itself has received $26,000,000 in funding through the U.S. Department of Commerce and the National Oceanic and Atmospheric Administration in support of the continuing aquatic resources environmental initiative. These funds have been used to support various initiatives including: 1) the PRIDE community grant program, 2) the PRIDE environmental education grant program, and 3) the PRIDE septic system loan program. In addition to the $26,000,000 in direct funds to PRIDE, additional PRIDE-related projects have been funding by the U.S. Army Corps of Engineers (COE) and the U.S. Environmental Protection Agency (EPA).

The efficient utilization of federal funds in improving the water quality and aquatic habitat of the region requires a process for assessing and evaluating the impacts of proposed and ongoing projects as well as some mechanism for prioritizing the allocation of additional funds. In order to evaluate the effectiveness of these projects, it is important to provide a formal monitoring and assessment program based on sound scientific principles. Three separate reports have been developed to provide an initial assessment of the existing water quality conditions in the 40 county PRIDE region (along with an identification of the water quality problems) and associated state and federal programs that have been designed to address these issues. In particular, the reports establish baseline conditions in the region for evaluating the impacts of the PRIDE programs and the extent to which such programs are satisfying their stated objectives of cleaning up the rivers and streams. This particular report focuses on both the environmental problems and associated programs that have been implemented to address these problems.

## 1.1 Physiographic Regions

The PRIDE region contains six major physiographic regions: the Eastern Coal Field, the Eastern Pennyroyal, the Inner Bluegrass, the Knobs, the Outer Blue Grass, and the

Western (see Figure 1.2). Each of these regions is topographically distinct and reflects the underlying geology (see Figure 1.3). The oldest exposed rocks are limestone of Ordovician age. They contain a few layers of shale and siltstone and form the surface of the Bluegrass Region. The Devonian and Silurian rocks are exposed in the Knobs surrounding the Bluegrass Region which provide a transition to the Mountain Region in the southeast and the Pennyroyal region to the south and southwest. Surface rocks in the Pennyroyal are of Mississippian age, mainly limestone but with some shales, siltstone, and sandstones. Pennsylvanian rocks are found at the surface in the Eastern Kentucky Coal Field which roughly corresponds to the Mountain Region. Pennyslyvanian rocks, consist mainly of sandstones, conglomerates, shale, and coal.

Soils in the region are largely influenced by the underlying geology and the associated physiographic regions. Almost all soils in Kentucky, with the exception of stream deposits, have developed under forest cover and under essentially the same climate. The various combinations of parent material, topography, and time of exposure may be expressed by dividing the region into 6 separate major soil association areas that roughly correspond to the same physiographic regions discussed earlier (see Figure 1.2). As can be seen from the figure, the dominant areas are the Eastern Pennyroyal and the Eastern Coal Fields. The Pennyroyal area is made up of the Waynesboror-Baxter-Gramon-Bedford soils series while the soils in the Eastern Coal Fields are made up of the Shelocta-Jefferson-Rarden-Weikert soil series. In general, the soils which make up the Licking and Big Sandy River basins are severely limited for the land application of wastewater.

## 1.2 Geographical Assessment Units

Because of the spatial and cumulative impacts of multiple projects within a region, it is best that project impacts be evaluated on a county or watershed basis. In using such an approach, it is important that an appropriate assessment scale be selected to maintain a balance between the ability to quantify the impacts of local projects and the ability to effectively monitor a larger number of sites. In consideration of both issues, the various projects within the PRIDE counties have been evaluated both on a county basis and on a watershed basis. In evaluating the projects on a watershed basis, the 8-digit HUC watersheds will be used as identified using the U.S. Geological Survey Hydrologic Unit Code (HUC) system. The HUC code is a multi-digit integer that is used to identify a particular watershed. A map of the various watershed assessment units that encompass the PRIDE region along with the associated county boundaries is shown in Figure 1.4.

In future years, additional refined assessments will be performed at the 11-digit HUC level. A map of the 11-digit HUC watersheds that encompass the PRIDE region is shown in Figure 1.5. It should be emphasized that use of the 11-digit watershed assessment scale is consistent with the Kentucky Watershed Management Framework Initiative, and will provide a strong synergism between the two programs. Previous and ongoing monitoring results from the Watershed Management Framework may be used to help support an assessment of the PRIDE projects. Use of a 11-digit HUC scale will provide the basis for the development of detailed watershed models that can be used to

evaluate proposed and ongoing PRIDE projects more accurately as well as be used in the formulation of detailed watershed management plans as envisioned as part of the overall Watershed Management Framework Initiative.

## 1.3 Assessment Strategy

In using monitoring; physical, chemical, and bacteriological parameters of a watershed may be measured in an attempt to assess the existing baseline conditions of a stream or to assess or predict the impacts of subsequent remediation efforts or projects. As a result of the topography and terrain of eastern Kentucky, stream water quantity and quality can change dramatically over short periods of time. These changes can be due to weather effects (such as rapid changes in precipitation) or to human activities like water removals, water inputs, or intermittent pollutant inputs. As a result, it is best to monitor water quality and flow continuously. Unfortunately, implementation of a continuous water quality and flow monitoring program for the over 200 11-digit HUC watersheds within the PRIDE region would be cost-prohibitive. However, by using a general region-wide monitoring effort coupled with a detailed watershed monitoring and modeling effort, calibrated models of selected watersheds may be developed which can then be extrapolated to the remaining basins on the basis of similarity of topography, land use, soils, and the density of straight pipes and other pollutant sources. Such models can then be used to predict the impacts of aggregate projects and guide in the targeting of more detailed sampling efforts.

The impacts of the PRIDE projects will be evaluated using both a geo-political basis (i.e. by counties) as well as a geo-hydrologic basis (i.e. by watersheds). The watershed assessment will involve a two-tier approach: 1) an annual region-wide assessment at the 8-digit HUC level, and 2) a more targeted river watershed assessment at the 11 digit HUC level rotated through each major river basin in the region over a five year rotating cycle (see Table 1.1). This approach is consistent with the National EPA watershed management approach and will directly support the goals and objectives of that program.

## 1.4 Kentucky Water Quality Standards

Water quality impacts within the PRIDE region will be evaluated on the basis of compliance with the Kentucky Water Quality Standards. KRS 224.10-100 requires the Kentucky Natural Resources and Environmental Protection Cabinet to develop and conduct a comprehensive program for the management of water resources and to provide for the prevention, abatement, and control of water pollution. This administrative regulation and 401 KAR 5:002, 5:026, 5:029, and 5:030 establish procedures to protect the surface waters of the Commonwealth, and thus protect water resources. This administrative regulation establishes water quality standards which consist of designated legitimate uses of the surface waters of the Commonwealth and the associated water quality criteria necessary to protect those uses. These water quality standards are minimum requirements that apply to all surface waters in the Commonwealth of Kentucky in order to maintain and protect them for designated uses.

## 1.5 Kentucky Water Quality Criteria

Kentucky's Water Quality Criteria are based on the designated use of the stream. Both general and separate criteria and limits for various physiochemical constituents or indicators have been developed for the following general categories: 1) Aquatic Life (both warm water and cold water habitats), 2) Water Based Recreation (both primary and secondary contact), 3 Domestic Water Supply, and 4) Outstanding State Resource Waters. In addition to water quality criteria based on these designated use categories, the Regulations also provide criteria for protection against constituent contamination from fish consumption.

## 1.6 Designated Uses

Kentucky lists water bodies (i.e. rivers, streams, lakes) according to specific uses in its water quality standards regulations. These uses include Warm Water Aquatic Habitat (WWAH), Cold Water Aquatic Habitat (CWAH), Domestic Water Supply (DWS), Primary Contact Recreation (PCR), Secondary Contact Recreation (SCR), and Outstanding Resource Waters (ORW). Those waters not specifically listed are classified (by default) for use as Warm water aquatic habitat, Primary and Secondary Contact Recreation, and Domestic Water Supply.

## 1.7 Kentucky 305(b) Report

Section 305(b) of the Federal Water Pollution Control Act of 1972 (P.L. 92-500), as subsequently amended and commonly known as the Clean Water Act, requires that states submit to the U.S. Environmental Protection Agency (EPA) on a biennial basis a report assessing current water quality conditions. The water quality assessment of rivers and streams is based on the support of designated uses in state waters depicted on U.S. Geological Survey (USGS) 1:100,000 scale topographic maps, excluding the Mississippi River.

In evaluating the extent to which the streams in the State are supporting their designated uses, Kentucky employs four assessment classes: 1) aquatic life (which focuses on warm water aquatic habitat), 2) fish consumption (which serves as a measure of compliance with the fish consumption criteria), 3) swimming (which represents the most restrictive of the primary and secondary contact recreation designated uses), and 4) drinking water. Different assessment methods are used to determine the use support for each class. In general, the assessment methods employ both physiochemical and biological data.

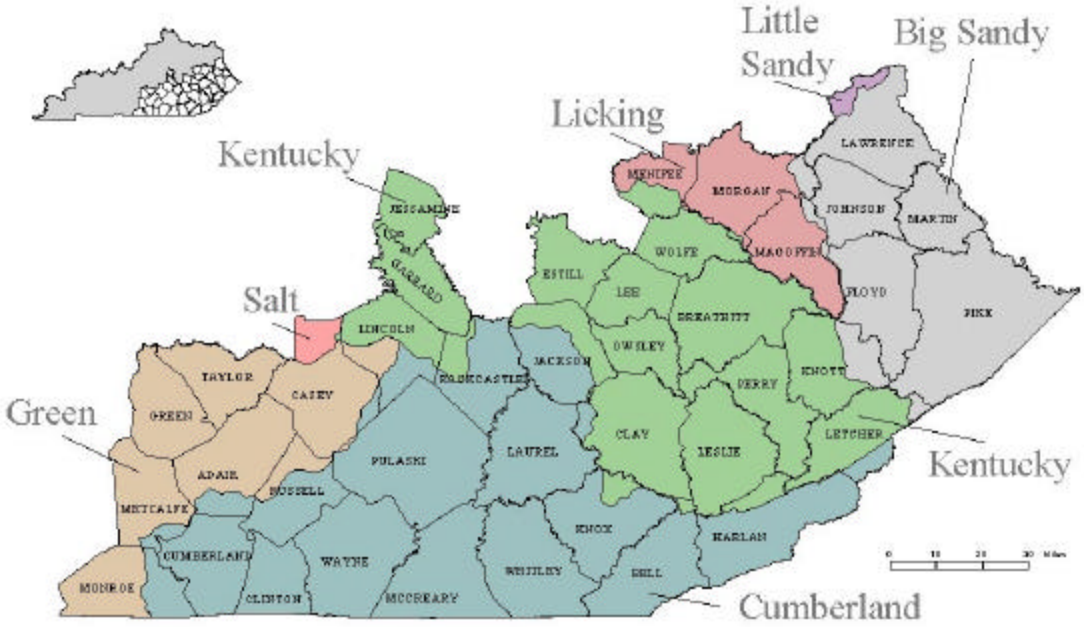



Figure 1.1 Counties and Major River Basins Located Within the PRIDE Region

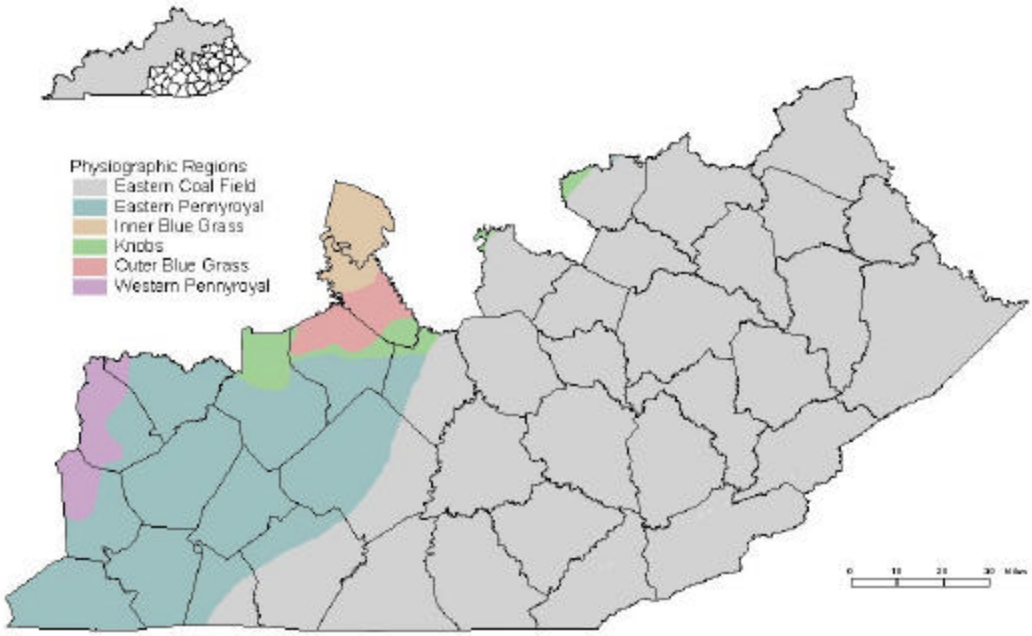



**Figure 1.2 Physiographic Regions within the 40-County PRIDE area.**

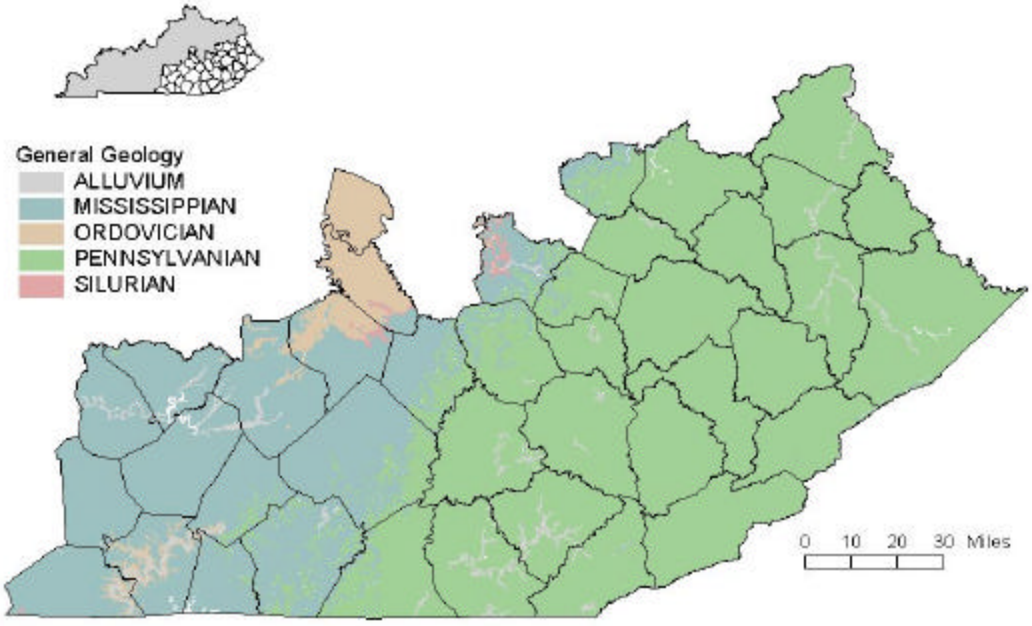



Figure 1.3 General Geologic Map of the PRIDE Region

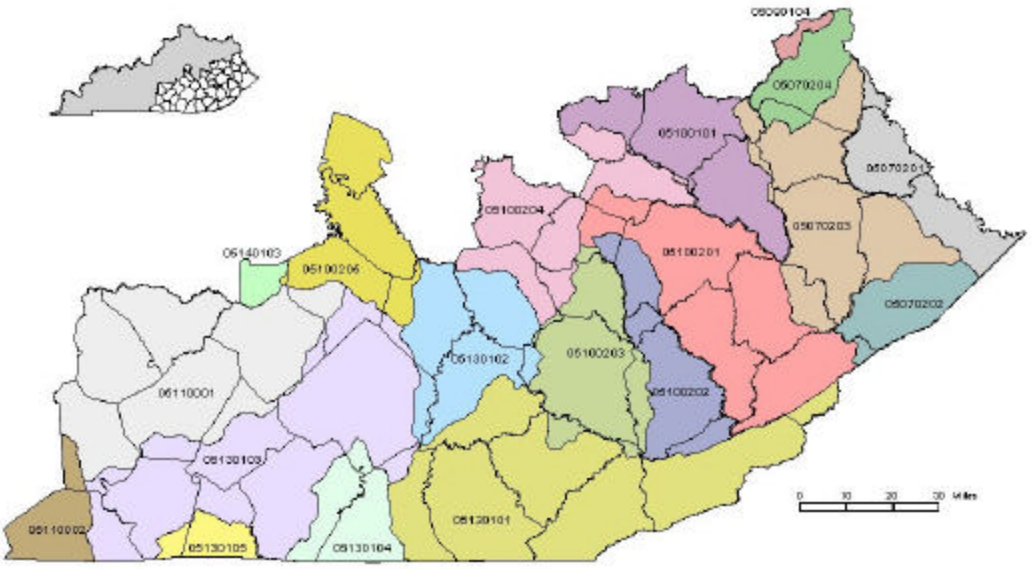



Figure 1.4 8-Digit Watersheds Located Within the PRIDE Region (with County Lines)

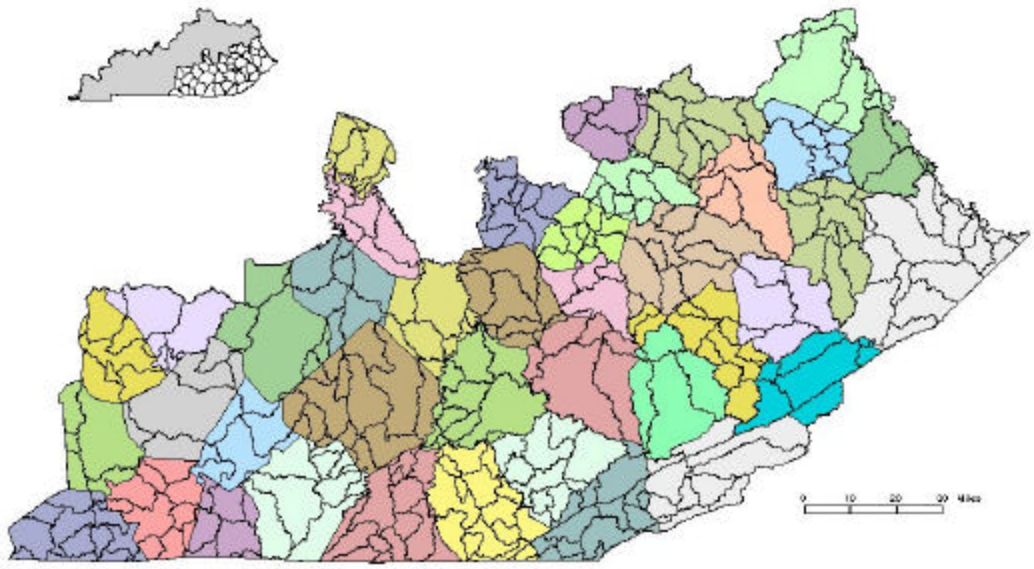


Figure 1.5 11-Digit Watersheds Within the PRIDE Region (with Counties in Color)

Based on a stream's designated use, the stream may be classified as 1) fully supporting, 2) partially supporting, or 3) not supporting. Overall use support of a particular stream is determined by following EPA guidelines that define fully supporting as fully supporting all uses for which data are available. If a segment supports one use but not another, it is listed as not supporting. For instance, if a segment supports a warm water aquatic habitat use but not a primary contact recreation use, it is listed as not supporting. A segment is listed as partially supporting if any assessed use falls into that category even if another use was fully supported. Many water bodies are assessed for only one use because data were not available to assess other uses. Those streams within the PRIDE area that did not meet the criteria for one or more of their assessment classes (generally their designated use) in 1998 are shown in Figure 1.6. A summary of each of the assessment classes are discussed in the following sections.

### 1.7.1 Aquatic Life Use Support

Aquatic Life use support is evaluated using both water quality and biological data. The utilized data are categorized as either "monitored" or "evaluated." Monitored data are derived from site specific ambient surveys, targeted watershed sites, and a probabilistic macro invertebrate network. Evaluated data are from other sources such as questionnaires to regional field personnel or from ambient surveys that were conducted more than five years ago. The criteria for assessing these data to determine use support are explained below. In areas where both chemical and biological data were available, the biological data were generally the determinant factor for establishing WAH use support status.

Physical and chemical parameters and criteria used by the Kentucky Division of Water to determine use support status are shown in Table 1.2. A stream is designated as fully supporting the Aquatic Life use when criteria for dissolved oxygen, un-ionized ammonia, temperature, and pH were not met in 10 percent or less of the samples collected. Partial support is indicated if any one criterion for these parameters was not met 11-25 percent of the time. The segment is not supporting if any one of these criteria was not met more than 25 percent of the time. Data for mercury, cadmium, copper, lead, and zinc are analyzed for violations of acute criteria listed in state water quality standards using the 1998 monitoring data. The segment fully supports its use if all criteria are met at stations with quarterly or less frequent sampling or if only one violation occurs at stations with monthly sampling. Partial support is indicated if any one criterion is not met more than once but in less than 10 percent of the samples. A segment is not supporting if criteria are exceeded in greater than 10 percent of the samples. The assessment criteria are closely linked to the way state water quality criteria were developed. Aquatic life is considered to be protected if, on the average, the acute criteria are not exceeded more than once every three years.

### 1.7.2 Swimming Use Support

Fecal coliform and pH data are used to indicate the degree of support for Primary Contact Recreation (swimming) use. The swimming use is considered fully supported if the criterion in Table 1.2 is met in 90 percent or more of the measurements, partially supported if the criterion was met in 89-75 percent of the measurements, and not supported if the criterion was met less than 75 percent of the time. Streams with pH below 6.0 units were judged to not support swimming use.

### 1.7.3 Fish Consumption Use Support

Fish consumption is a category that, in conjunction with aquatic life use, assesses attainment of the fishable goal of the Clean Water Act. Assessment of the fishable goal was separated into these two categories in 1992 because a fish consumption advisory does not preclude attainment of the aquatic life use and vice versa. Separating fish consumption and aquatic life uses gives a clearer picture of actual water quality conditions. The following criteria are used to assess support for the fish consumption use:

* Fully Supporting: No fish advisories or bans in effect.

* Partially Supporting: "Restricted consumption" fish advisory or ban in effect for general population or a sub-population that could be at potentially greater risk (e.g., pregnant women, children). Restricted consumption is defined as limits on the number of meals consumed per unit time for one or more fish species.

* Not supporting: "No consumption" fish advisory or ban in effect for general population, or a sub-population that could potentially be at greater risk, for one or more fish species; commercial fishing ban in effect.

### 1.7.4. Drinking Water Use Support

For purposes of assessing drinking water use, federal EPA Phase II/Phase V finished water results are compared to established maximum contaminant levels (MCLs). Although not a quantitative measurement of ambient water quality, it highlights water in which certain pollutants are high enough to exceed drinking water criteria even after conventional treatment by the drinking water plant. Lacking in-stream data, EPA's 1998 305(b) report guidance recommends using the finished water data for assessing drinking water use. Because of the importance of this data, each individual watershed assessment summary includes a separate table that provides the locations of each water sources and water withdrawal point.

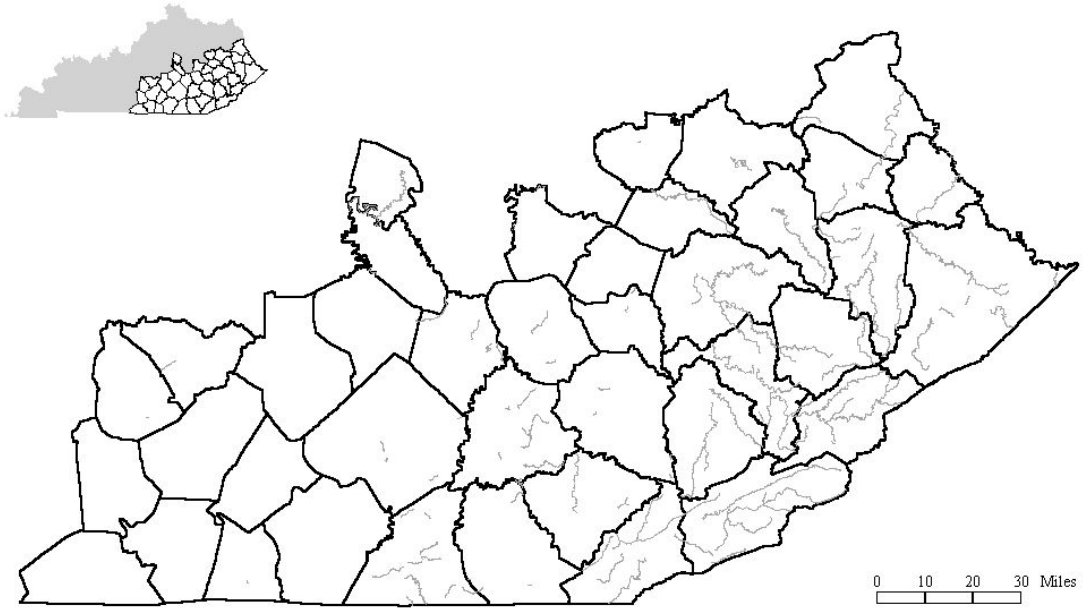



Figure 1.6 Assessed Streams in the PRIDE Region Not Fully Meeting Their Designated Uses.

Table 1.1 Watershed Assessment Cycle

| **Watersheds** | **Assessment Year** |
|---|---|
| Kentucky | 2000-2001 |
| Licking/Salt | 2001-2002 |
| Upper Cumberland | 2002-2003 |
| Green | 2003-2004 |
| Big/Little Sandy | 2004-2005 |

Table 1.2 Physical and Chemical Parameters and Criteria Used to Determine Use Support Status At Fixed Stations

| **Parameter** | **Criterion a** |
|---|---|
| Dissolved Oxygen | 4.0 mg/l |
| Temperature | 30oC |
| pH | 6 to 9 units |
| Un-ionized Ammonia-N | 0.05 mg/1 |
| Mercury | 2.4 ug/1 |
| Cadmium | e (1.28 lnx - 3.828)b |
| Copper | e (.9422 ln x -1.464)b |
| Lead | e (1.273 ln x - 1.460)b |
| Zinc | e (.8473 ln x + .8604)b |
| Fecal Coliform Bacteria | 400 colonies/100 ml (May 1 thru Oct 1) |

a from Ky Water Quality Standards
b x = hardness in mg/1 as CaCO3

Table 1.3 Miles of Streams Not Meeting Their Designated Use

| County | Miles |
|---|---|
| Adair | 6.05 |
| Bell | 79.84 |
| Breathitt | 130.83 |
| Casey | 0 |
| Clay | 45.9 |
| Clinton | 0 |
| Cumberland | 15.85 |
| Estill | 10.6 |
| Floyd | 19.2 |
| Garrard | 11.78 |
| Green | 2.38 |
| Harlan | 141.4 |
| Jackson | 0 |
| Jessamine | 30.5 |
| Johnson | 13.2 |
| Knott | 24.66 |
| Knox | 63.73 |
| Laurel | 26.64 |
| Lawrence | 83.06 |
| Lee | 35.04 |
| Leslie | 10.6 |
| Letcher | 51.86 |
| Lincoln | 24.1 |
| Magoffin | 27.8 |
| Martin | 23.24 |
| McCreary | 41.6 |
| Menifee | 0 |
| Metcalfe | 0 |
| Monroe | 0 |
| Morgan | 26.8 |
| Owsley | 7.4 |
| Perry | 97.05 |
| Pike | 16 |
| Pulaski | 15.7 |
| Rockcastle | 31.5 |
| Russell | 4.4 |
| Taylor | 6.04 |
| Wayne | 7.8 |
| Whitley | 31.16 |
| Wolfe | 25.22 |

# ENVIRONMENTAL PROBLEMS

## 2.1 Kentucky 303(d) Report

Pursuant to Section 303(d) of the Clean Water Act, the State of Kentucky has developed a list of waterbodies presently not supporting designated uses along with the source of impairment. As required by 40 CFR 130.7(b)(4), these waters have been prioritized for total maximum daily load (TMDL) development. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. TMDL studies and associated reports are required as part of section 303(d) of the Clean Water Act for all streams not supporting their designated uses. Each TMDL is required to identify the 1) the existing pollutant load, 2) the TMDL, 3) the sources of the total load, 4) a load reduction plan, and 5) an implementation strategy. A summary of the 303(d) listed streams (summarized by county and 11-digit watershed) that fall within the PRIDE counties is provided in Table 2.1. As can be seen from the table, a significant number of streams are not meeting their designated use due to pathogen, nutrient, and pH impairment mostly likely caused by ineffective wastewater systems and/or ineffective or historical mining operations. Potential sources of these associated impairments are discussed in the following sections.

## 2.2 Wastewater Treatment Plants

There are approximately 70 wastewater treatment plants in the PRIDE region (see Figure 2.1). Historically, a significant source of pathogen impairment in the streams of Eastern Kentucky has been the improper operation of many of these treatment plants. During the 1990s, the Division of Water initiated a program of monitoring and fines that resulted in significant reductions of fecal coliforms in both the North Fork of the Kentucky River and the Upper Cumberland River Basin.

## 2.3 Package Plants

In addition to problems with municipal wastewater treatment plants, small privately owned package plants also cause significant pathogen impairment problems when not operated properly. Package plants are small wastewater treatment facilities. There are approximately 390 package plants in the PRIDE region (see Figure 2.2). Statistics on the number of facilities per county are provided Table 2.3. The vast majority of the plants are residential plants and are located in Floyd, Pike and Johnson counties. This is somewhat reflective of the fact that the soils in these counties are inadequate to support more traditional septic systems.

Table 2.1 2002 303(d) Listed Streams in PRIDE Region

| Stream | Miles | County | Impaired Use | Pollutant | Priority |
|---|---|---|---|---|---|
| Left Fork Straight Creek | 13 | Bell | SW,AL | Ph,SS | 1 |
| Sims Fork of Left Fork Straight Creek | 5.2 | Bell | AL | S,H | 1 |
| Stony Fork of Bennetts Fork | 5.2 | Bell | AL | S,H | 1 |
| Buckhorn Creek of Troublesome Creek | 2.3 | Breathitt | SW | - | 1 |
| Cane Creek of North Fork Kentucky River | 9.5 | Breathitt | AL | S,H,TDS | 1 |
| Hunting Creek of Quicksand Creek | 2.6 | Breathitt | AL | S,TDS | 1 |
| Long Fork of Buckhorn Creek | 4.6 | Breathitt | AL | S,T,H,TDS | 1 |
| Lost Creek of Troublesome Creek | 6.4 | Breathitt | SW | - | 1 |
| North Fork Kentucky River and Tributaries | 46.83 | Breathitt | AL | P | 1 |
| Quicksand Creek of North Fork Kentucky River | 8.6 | Breathitt | AL | S,TDS | 1 |
| Spring Fork of Quicksand Creek | 3.8 | Breathitt | SW | P | 1 |
| Troublesome Creek Of North Fork Kentucky River | 16.83 | Breathitt | SW | P | 1 |
| Troublesome Creek Of North Fork Kentucky River | 8.568 | Breathitt | AL | S | 1 |
| Laurel Creek of Goose Creek | 2.9 | Clay | SW | P | 1 |
| Red Bird River of South Fork Kentucky River | 15 | Clay | AL | - | 1 |
| Ferris Fork Creek of Marrowbone Creek | 1.2 | cumberland | AL | S,H | 1 |
| Levisa Fork of Big Sandy River | 19.2 | Floyd | SW | P | 1 |
| Dix River of Kentucky River | 3 | Garrard | AL | S,TDS | 1 |
| South Fork Russell Creek of Russell Creek (actually a UT of South Fork Russell Creek) | 0.6 | Green | SW | P | 1 |
| UT of South Fork Russell Creek (River Mile 4.85) | 0.6 | Green | SW | P | 1 |
| Little Pitman Creek of Pitman Creek | 1.18 | Green | SW | P | 1 |

| | | | | | |
|---|---|---|---|---|---|
| Baily Creek of Clover Fork | 2.5 | Harlan | SW,AL | P,S | 1 |
| Catron Creek of Martins Fork | 8 | Harlan | AL,SW | H,SS,P | 1 |
| Clover Fork of Poor Fork | 29.1 | Harlan | AL | FA | 1 |
| Clover Fork of Poor Fork | 1.2 | Harlan | AL | M | 1 |
| cumberland River of Tennessee River | 9.3 | Harlan | SW | P | 1 |
| Ewing Creek of cumberland River | 2.7 | Harlan | AL | - | 1 |
| Looney Creek of Poor Fork | 5.5 | Harlan | SW | P | 1 |
| Martins Fork of cumberland River | 10.1 | Harlan | SW | P | 1 |
| Poor Fork of cumberland River | 25.1 | Harlan | SW | P | 1 |
| Poor Fork of cumberland River | 14.9 | Harlan | AL | N | 1 |
| Yocum Creek of Clover Fork | 6.5 | Harlan | AL,SW | N,P | 1 |
| Levisa Fork of Big Sandy River | 13.2 | Johnson | SW | P | 1 |
| Troublesome Creek Of North Fork Kentucky River | 14.35 | Knott | AL | S | 1 |
| Troublesome Creek Of North Fork Kentucky River | 7.308 | Knott | AL | S | 1 |
| Balls Fork of Troublesome Creek | 3 | Knott | AL | S | 1 |
| Big Indian Creek of cumberland River | 5.1 | Knox | AL | S | 1 |
| Brush Creek of cumberland River | 2.8 | Knox | AL | S,DO,H | 1 |
| Richland Creek of cumberland River | 6.2 | Knox | AL | S,PH,H | 1 |
| Laurel River of cumberland River | 2.3 | Laurel | AL | - | 1 |
| Little Laurel River of Laurel River | 8.3 | Laurel | AL | DO,H | 1 |
| Mitchell Creek of Sinking Creek | 3.6 | Laurel | AL | S,DO,H | 1 |
| South Fork Rockcastle River | 0.7 | Laurel | AL | S,SS,T | 1 |
| UT of Little River(River Mile 15.8) | 1.4 | Laurel | SW | P | 1 |
| White Oak Creek of Sinking Creek | 1 | Laurel | AL | Cl | 1 |
| Whitley Branch | 1.5 | Laurel | AL | S,M | 1 |
| Whitley Branch of Little Laurel River | 1 | Laurel | AL,SW | M,P | 1 |

| | | | | | |
|---|---|---|---|---|---|
| Levisa Fork of Big Sandy River | 37.9 | Lawrence | SW,AL | P,S,DO | 1 |
| Tug Fork of Big Sandy River | 10.2 | Lawrence | AL | H,TDS | 1 |
| Tug Fork of Big Sandy River | 8.16 | Lawrence | AL,SW | SS,P,DO | 1 |
| North Fork Kentucky River and Tributaries | 31.54 | Lee | AL | P | 1 |
| North Fork Kentucky River and Tributaries | 37.56 | Letcher | AL | P | 1 |
| Left Fork Millstone Creek of Millstone Creek | 1.2 | Letcher | AL | N | 1 |
| North Fork Kentucky River of Kentucky River | 5.1 | Letcher | SW,AL | P,S,T,FA,H,TDS | 1 |
| Potter Fork of Boone Fork | 4.4 | Letcher | SW | P | 1 |
| Rockhouse Creek of North Fork Kentucky River | 3.6 | Letcher | AL | H,S | 1 |
| Hanging Fork of Dix River | 15 | Lincoln | AL | H,S | 1 |
| Burning Fork of Licking River | 2.9 | Magoffin | SW | P | 1 |
| Johnson Creek of Licking River | 3.1 | Magoffin | SW | P | 1 |
| Licking River of Ohio River | 7.8 | Magoffin | SW | P | 1 |
| Middle Fork Licking River of Licking River | 2.5 | Magoffin | SW | P,S,FA,H,T | 1 |
| Puncheon Camp Creek of Licking River | 1.1 | Magoffin | AL | DO | 1 |
| Tug Fork of Big Sandy River | 23.24 | Martin | SW | P | 1 |
| Bear Creek of South Fork cumberland River | 3.2 | McCreary | AL | S,T,FA,H,TDS | 1 |
| Cane Branch of Middle Fork (Beaver Creek) | 2 | McCreary | SW,AL | P,S,DO | 1 |
| Copperas Fork of Cooper Creek | 3.8 | McCreary | AL | PH | 1 |
| Marsh Creek of cumberland River | 3 | McCreary | AL,SW | PH | 1 |
| Roaring Paunch Creek | 15.6 | McCreary | AL | SI | 1 |
| Rock Creek of South Fork cumberland River | 4.1 | McCreary | AL | S | 1 |
| UT of Jennys Branch (River Mile 3.4) | 1.1 | McCreary | AL,SW | PH | 1 |
| Ryans Creek of Jellico Creek | 2.7 | McCreary | AL,SW | PH | 1 |
| Ryans Creek of Jellico Creek | 2.7 | McCreary | AL | S,N | 1 |
| Elk Fork of Licking River | 4.9 | Morgan | AL,SW | PH,SS | 1 |

| | | | | | |
|---|---|---|---|---|---|
| Straight Creek of Elk Fork | 1.8 | Morgan | AL,SW | PH,SS | 1 |
| North Fork Kentucky River and Tributaries | 39.51 | Perry | AL | P | 1 |
| Troublesome Creek Of North Fork Kentucky River | 18.315 | Perry | SW | P | 1 |
| Troublesome Creek Of North Fork Kentucky River | 9.324 | Perry | AL | S,FA,H,T | 1 |
| Big Willard Creek of North Fork Kentucky River | 4.5 | Perry | AL | S,FA,H,T | 1 |
| Carr Fork of North Kentucky River | 8.9 | Perry | AL | S | 1 |
| Grapevine Creek of North Fork Kentucky River | 1.1 | Perry | SW | P | 1 |
| Lotts Creek of North Kentucky River | 4.8 | Perry | SW | P | 1 |
| Levisa Fork of Big Sandy River | 8.4 | Pike | SW | P | 1 |
| Wildcat Branch of cumberland River | 2.1 | Pulaski | FC | M | 1 |
| Brush Creek of Roundstone Creek | 6.4 | Rockcastle | AL | S | 1 |
| Little Pitman Creek of Pitman Creek | 3.02 | Taylor | AL | S,DO | 1 |
| Little Pitman Creek of Pitman Creek | 3.02 | Taylor | AL,FC | DO | 1 |
| Elk Spring Creek of Beaver Creek | 7.8 | Wayne | AL | M,N | 1 |
| Ryans Creek of Jellico Creek | 2.7 | Whitley | AL | - | 1 |
| Ryans Creek of Jellico Creek | 2.7 | Whitley | AL | S | 1 |
| Lynn Camp Creek of Laurel River | 4.02 | Whitley | AL | S,H,T | 1 |
| Buck Creek of Clear Fork | 1.4 | Whitley | AL | S | 1 |
| Laurel Fork of Clear Fork | 3.6 | Whitley | AL | S | 1 |
| Wolf Creek of Clear Fork | 1.8 | Whitley | AL | S | 1 |
| North Fork Kentucky River and Tributaries | 7.32 | Wolfe | AL | P | 1 |
| UT of Swift Camp Cr. (River Mile 11.7) | 1.5 | Wolfe | AL | S | 1 |
| Crocus Creek of cumberland River | 6.05 | Adair | - | | 2 |
| cumberland River of Tennessee River | 3.9 | Bell | SW | P | 2 |

| | | | | | |
|---|---|---|---|---|---|
| Greasy Creek of cumberland River | 11.4 | Bell | SW,AL | P,SS.Ph | 2 |
| Little Clear Creek of Clear Creek | 10.4 | Bell | AL | - | 2 |
| Yellow Creek of cumberland River | 18.5 | Bell | AL | S,H | 2 |
| Yellow Creek of cumberland River | 9.6 | Bell | SW | P | 2 |
| Puckett Creek of cumberland River | 2.64 | Bell | AL | TDS | 2 |
| Big Caney Creek of Quicksand Creek | 7.7 | Breathitt | AL,SW | SI,H | 2 |
| Cope Fork of Frozen Creek | 1.9 | Breathitt | AL | S,T,H | 2 |
| Puncheon Camp Creek of Middle Fork Kentucky River | 3.2 | Breathitt | AL | S,T,H,TDS | 2 |
| South Fork Quicksand Creek of Quicksand Creek | 8 | Breathitt | AL | S,T,H,TDS | 2 |
| Collins Fork of Goose Creek | 3.9 | Clay | AL | S | 2 |
| Goose Creek of South Fork Kentucky River | 9.3 | Clay | AL,SW | P,TDS,DO | 2 |
| Horse Creek of Goose Creek | 6.8 | Clay | AL | N | 2 |
| Laurel Creek of Goose Creek | 1 | Clay | AL | S,Ph | 2 |
| Sexton Creek of Goose Creek | 7 | Clay | AL | S,H | 2 |
| Big Renox Creek of cumberland River | 5.8 | cumberland | AL | H | 2 |
| Marrowbone Creek of cumberland Creek | 2.8 | cumberland | AL | S,H | 2 |
| Crocus Creek of cumberland River | 6.05 | cumberland | AL | S | 2 |
| Station Camp Creek of Kentucky River | 7.2 | Estill | SW | P | 2 |
| Kentucky River of Ohio River | 3.4 | Estill | SW | P | 2 |
| White Lick Creek of Paint Lick Creek | 2.8 | Garrard | AL | S,TDS | 2 |
| Paint Lick Creek of Kentucky River | 5.98 | Garrard | AL | M,N | 2 |
| Cranks Creek of Martins Fork | 0.6 | Harlan | AL | S,H | 2 |
| cumberland River of Ohio River | 6.6 | Harlan | SW | P | 2 |
| Martins Fork of cumberland River | 6.9 | Harlan | SW | P | 2 |
| Puckett Creek of cumberland River | 7.4 | Harlan | AL | S,H | 2 |

| | | | | | |
|---|---|---|---|---|---|
| Hickman Creek of Kentucky River | 25 | Jessamine | AL | S,H | 2 |
| West Hickman Creek of Hickman Creek | 3 | Jessamine | SW | P | 2 |
| West Hickman Creek of Hickman Creek | 2.5 | Jessamine | SW | P | 2 |
| Lynn Camp Creek of Laurel River | 0.37 | Knox | AL | S,H,T | 2 |
| Goodin Creek of cumberland River | 0.2 | Knox | AL | S | 2 |
| Hammon's Fork of Collins Fork | 1.9 | Knox | AL | S | 2 |
| Little Popular Creek of cumberland River | 2.8 | Knox | SW | P | 2 |
| Middle Fork of Richland Creek | 1.2 | Knox | AL,SW | S,DO,P | 2 |
| Richland Creek of cumberland River | 19.6 | Knox | SW | P | 2 |
| Richland Creek of cumberland River | 13.4 | Knox | AL,SW | H,SS,P | 2 |
| Stinking Creek of cumberland River | 2.1 | Knox | AL | S | 2 |
| Lynn Camp Creek of Laurel River | 0.36 | Knox | AL | S | 2 |
| East Fork of Lynn Camp Creek | 2.3 | Knox | AL | S | 2 |
| Meadow Creek of cumberland River | 3.4 | Knox | AL,SW | H,SS,P | 2 |
| Bull Creek of Collins Fork | 2 | Knox | AL | FA,H | 2 |
| Lynn Camp Creek of Laurel River | 0.135 | Laurel | AL | N | 2 |
| Raccoon Creek of South Fork Rockcastle River | 2.7 | Laurel | AL | S,H | 2 |
| South Fork Rockcastle River | 4 | Laurel | AL | S,H | 2 |
| Big Sandy River of Ohio River | 26.8 | Lawrence | SW | P | 2 |
| Hell Creek of North Fork Kentucky River | 3.5 | Lee | AL | - | 2 |
| Middle Fork Kentucky River | 2.9 | Leslie | AL | - | 2 |
| Polls Creek of Cutshin Creek | 4.7 | Leslie | AL | S,PH | 2 |
| Wooten Creek of Cutshin Creek | 3 | Leslie | AL | S | 2 |
| Gilmore Creek of Craborchard Creek | 2.4 | Lincoln | AL | S | 2 |
| Copper Creek of Dix River | 5.9 | Lincoln | AL | S | 2 |
| Copper Creek of Dix River | 0.8 | Lincoln | AL | S | 2 |

| | | | | | |
|---|---|---|---|---|---|
| Licking River of Ohio River | 6.4 | Magoffin | SW | P | 2 |
| Trace Fork of Licking River | 3.1 | Magoffin | AL | S | 2 |
| Left Fork White Oak Creek of Licking River | 0.9 | Magoffin | SW | P | 2 |
| Jenneys Branch of Laurel Creek | 3.4 | McCreary | AL,SW | PH | 2 |
| Caney Creek of Licking River | 4.2 | Morgan | AL,SW | PH | 2 |
| Elk Fork of Licking River | 2.1 | Morgan | AL,SW | PH | 2 |
| Left Fork White Oak Creek of Licking River | 0.9 | Morgan | AL | S,T,FA,H | 2 |
| Licking River of Ohio River | 12.9 | Morgan | AL | S,T,FA,H | 2 |
| Left Fork Island Creek of Island Creek | 5 | Owsley | AL | S,FA,H | 2 |
| Lower Buffalo Creek of South Fork Kentucky River | 2.4 | Owsley | AL | S,T,FA,H | 2 |
| Carr Fork of North Kentucky River | 10.6 | Perry | AL | S | 2 |
| Knox Creek of Tug Fork | 7.6 | Pike | AL | S,T,H,FA,TDS | 2 |
| Gilmore Creek of Craborchard Creek | 2.4 | Pulaski | AL | S | 2 |
| Briary Creek of Buck Creek | 4.4 | Pulaski | AL | S,T,FA,H,TDS | 2 |
| Buck Creek of cumberland River | 0.5 | Pulaski | AL | S,FA,H,T | 2 |
| Indian Creek of Buck Creek | 4.1 | Pulaski | AL,SW | P | 2 |
| Pitman Creek of cumberland River | 1.7 | Pulaski | AL,SW | S,P | 2 |
| Sam Branch of Fishing Creek | 0.5 | Pulaski | AL | S | 2 |
| Copper Creek of Dix River | 5.9 | Rockcastle | AL | S,H | 2 |
| Copper Creek of Dix River | 0.8 | Rockcastle | AL | - | 2 |
| Crooked Creek of Roundstone Creek | 5.4 | Rockcastle | AL | PH | 2 |
| Renfro Creek of Roundstone Creek | 3 | Rockcastle | SW | P | 2 |
| Roundstone Creek of Rockcastle River | 6.8 | Rockcastle | SW | P | 2 |
| Skegg Creek of Rockcastle River | 3.2 | Rockcastle | AL | S,DO | 2 |
| Big Lily Creek of cumberland River (Lake cumberland) | 4.4 | Russell | AL | DO,H,FA | 2 |

| | | | | | |
|---|---|---|---|---|---|
| East Fork of Lynn Camp Creek | 2.3 | Whitley | AL | M | 2 |
| Lynn Camp Creek of Laurel River | 4.14 | Whitley | AL,SW | H,SS,P | 2 |
| Mud Creek of Clear Fork | 5.1 | Whitley | AL | S | 2 |
| Meadow Creek of cumberland River | 3.4 | Whitley | AL | S | 2 |
| Lacey Creek of Red River | 1.8 | Wolfe | AL | - | 2 |
| Swift Camp Creek of Red River | 13.6 | Wolfe | AL | - | 2 |
| Upper Devil Creek of North Fork Kentucky River | 1 | Wolfe | AL | H | 2 |

Abbreviations: Impaired Use: AL – Aquatic Life, SW – Swimming.
Pollutant: P – Pathogens, N – Nutrients, S – Siltation, H –Habitat Alteration, DO – low dissolved oxygen.

Table 2.3 Package Plants in Region

| COUNTY | Number | Total Capacity (MGD) |
|---|---|---|
| ADAIR | 2 | 0.0265 |
| BELL | 5 | 0.1060 |
| CLAY | 4 | 0.1380 |
| CLINTON | 1 | 0.0100 |
| CUMBERLAND | 3 | 0.1040 |
| ESTILL | 4 | 0.0267 |
| FLOYD | 118 | 0.2107 |
| GARRARD | 1 | 0.0200 |
| HARLAN | 12 | 0.3390 |
| JACKSON | 4 | 0.0579 |
| JESSAMINE | 2 | 0.0075 |
| JOHNSON | 30 | 0.2088 |
| KNOTT | 8 | 0.1775 |
| KNOX | 2 | 0.0045 |
| LAUREL | 6 | 0.0841 |
| LAWRENCE | 7 | 0.0422 |
| LEE | 2 | 0.0135 |
| LESLIE | 7 | 0.0287 |
| LETCHER | 5 | 0.0155 |
| LINCOLN | 1 | 0.0035 |
| MAGOFFIN | 7 | 0.0048 |
| MARTIN | 3 | 0.0800 |
| MCCREARY | 9 | 0.1550 |
| MENIFEE | 1 | 0.0210 |
| MORGAN | 1 | 0.0050 |
| OWSLEY | 2 | 0.0055 |
| PERRY | 14 | 0.1167 |
| PIKE | 94 | 0.5795 |
| PULASKI | 6 | 0.0371 |
| ROCKCASTLE | 1 | 0.0005 |
| RUSSELL | 8 | 0.0040 |
| TAYLOR | 8 | 0.1205 |
| WAYNE | 4 | 0.0350 |
| WHITLEY | 5 | 0.2235 |
| WOLFE | 3 | 0.0127 |

## 2.4 Straight Pipes

A straight pipe consists of a sewer line from a house or building that discharges raw sewage directly into a receiving stream or river. As a result, straight pipes constitute a significant source of pathogen impairment of streams. Based on data collected by the regional area development districts, it is estimated that there are approximately 16,000 straight pipes in the PRIDE area (see Figure 2.3). Statistics on the number of straight pipes per county are provided in Table 2.4.

## 2.5 Failing Septic Systems

Based on data collected by the regional area development districts, it is estimated that there are at least 17,000 failing septic systems in the PRIDE area (see Figure 2.4). In many cases, such systems can have as significant impact on nearby streams as ineffective package plants or straight pipes. Statistics on the number of failing septic systems per county are provided in Table 2.5.

## 2.6 Illegal Dumps

Based on data collected by the regional area development districts, it is estimated that there are approximately 2,000 illegal dumps in the 40 county PRIDE region (see Figure 2.5). In addition to detracting from the natural beauty of eastern Kentucky, such dumps can be a source of chemical contamination of nearby streams as well as a breeding ground for insects. Statistics on the number of dumps per county are provided in Table 2.6.

## 2.7 Mining Operations

As of June 30, 2000, there are over 2000 permitted mining operations in the 40 county PRIDE region (See Figure 2.6). Improperly operated mining operations can contribute to acid mine drainage and erosion and siltation which can severely impact aquatic species. General statistics on the mining operations in each county are provided in Table 2.7.

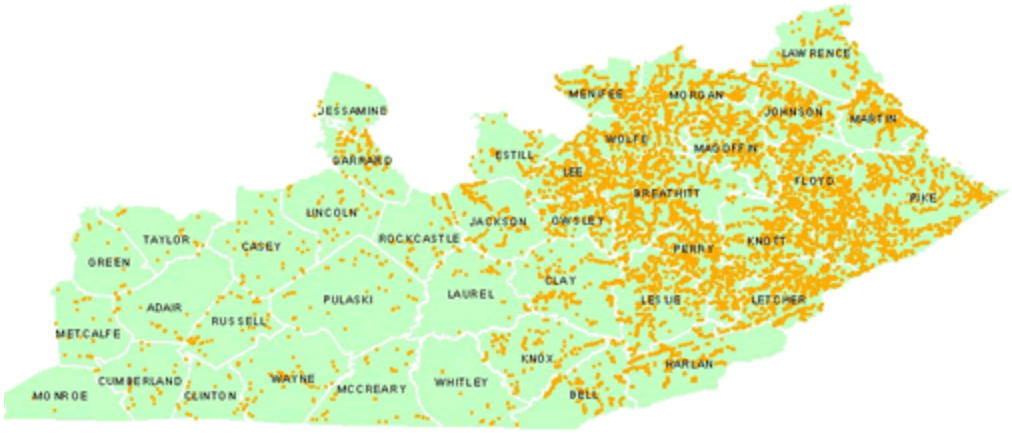



Fig 2.3 Location of Straight Pipes in the Pride Region

Table 2.4 Straight Pipes in PRIDE Region

| County | No. of St. Pipes |
|---|---|
| Adair | 50 |
| Bell | 376 |
| Breathitt | 1031 |
| Casey | 68 |
| Clay | 650 |
| Clinton | 32 |
| Cumberland | 42 |
| Estill | 98 |
| Floyd | 1447 |
| Garrard | 139 |
| Green | 24 |
| Harlan | 1846 |
| Jackson | 530 |
| Jessamine | 27 |
| Johnson | 1119 |
| Knott | 728 |
| Knox | 197 |
| Laurel | 72 |
| Lawrence | 306 |
| Lee | 405 |
| Leslie | 510 |
| Letcher | 1858 |
| Lincoln | 49 |
| Magoffin | 1177 |
| Martin | 1175 |
| McCreary | 80 |
| Menifee | 453 |
| Metcalfe | 30 |
| Monroe | 3 |
| Morgan | 1062 |
| Owsley | 342 |
| Perry | 969 |
| Pike | 1715 |
| Pulaski | 74 |
| Rockcastle | 76 |
| Russell | 85 |
| Taylor | 33 |
| Wayne | 87 |
| Whitley | 34 |
| Wolfe | 434 |

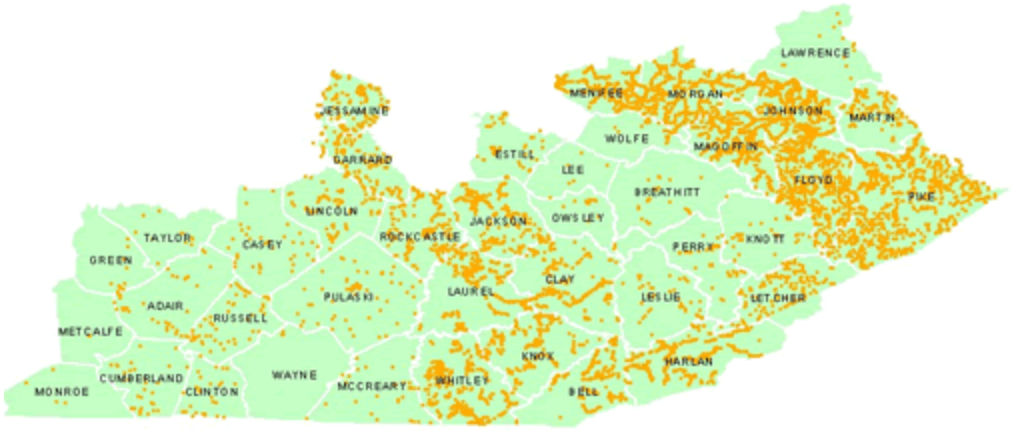



Figure 2.4 Failing Septic Systems in PRIDE Region

## Table 2.5 Failing Septic Systems in PRIDE Region

| County | No. of Failing Septic Systems |
|---|---|
| Adair | 41 |
| Bell | 426 |
| Breathitt | 28 |
| Casey | 40 |
| Clay | 795 |
| Clinton | 27 |
| Cumberland | 33 |
| Estill | 61 |
| Floyd | 1196 |
| Garrard | 182 |
| Green | 13 |
| Harlan | 2519 |
| Jackson | 443 |
| Jessamine | 753 |
| Johnson | 1925 |
| Knott | 44 |
| Knox | 523 |
| Laurel | 990 |
| Lawrence | 16 |
| Lee | 6 |
| Leslie | 41 |
| Letcher | 146 |
| Lincoln | 135 |
| Magoffin | 1344 |
| Martin | 426 |
| McCreary | 35 |
| Menifee | 687 |
| Metcalfe | 2 |
| Monroe | 4 |
| Morgan | 1132 |
| Owsley | 20 |
| Perry | 46 |
| Pike | 1755 |
| Pulaski | 142 |
| Rockcastle | 348 |
| Russell | 51 |
| Taylor | 11 |
| Wayne | 12 |
| Whitley | 838 |
| Wolfe | 25 |

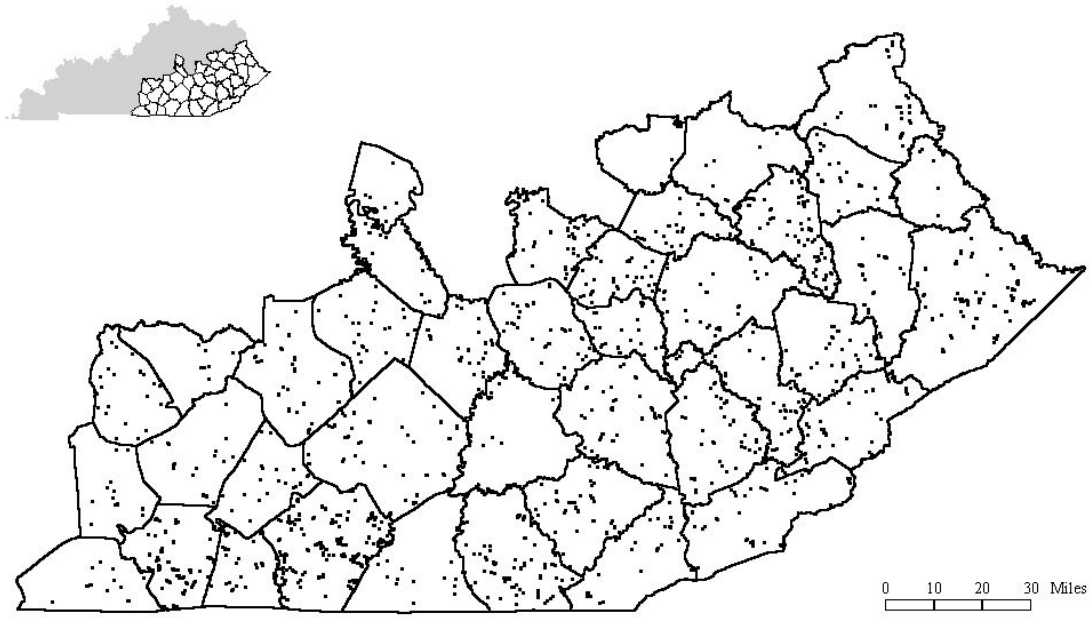



Figure 2.5 Illegal Dumps in the PRIDE Region.

Table 2.6 Illegal Dumps in PRIDE Region

| County | Dumps |
|---|---|
| Adair | 20 |
| Bell | 38 |
| Breathitt | 45 |
| Casey | 43 |
| Clay | 70 |
| Clinton | 39 |
| Cumberland | 113 |
| Estill | 47 |
| Floyd | 34 |
| Garrard | 22 |
| Green | 23 |
| Harlan | 70 |
| Jackson | 66 |
| Jessamine | 12 |
| Johnson | 29 |
| Knott | 50 |
| Knox | 98 |
| Laurel | 28 |
| Lawrence | 45 |
| Lee | 35 |
| Leslie | 51 |
| Letcher | 60 |
| Lincoln | 31 |
| Magoffin | 101 |
| Martin | 7 |
| McCreary | 17 |
| Menifee | 7 |
| Metcalfe | 19 |
| Monroe | 18 |
| Morgan | 7 |
| Owsley | 32 |
| Perry | 55 |
| Pike | 102 |
| Pulaski | 55 |
| Rockcastle | 45 |
| Russell | 24 |
| Taylor | 9 |
| Wayne | 222 |
| Whitley | 175 |
| Wolfe | 32 |

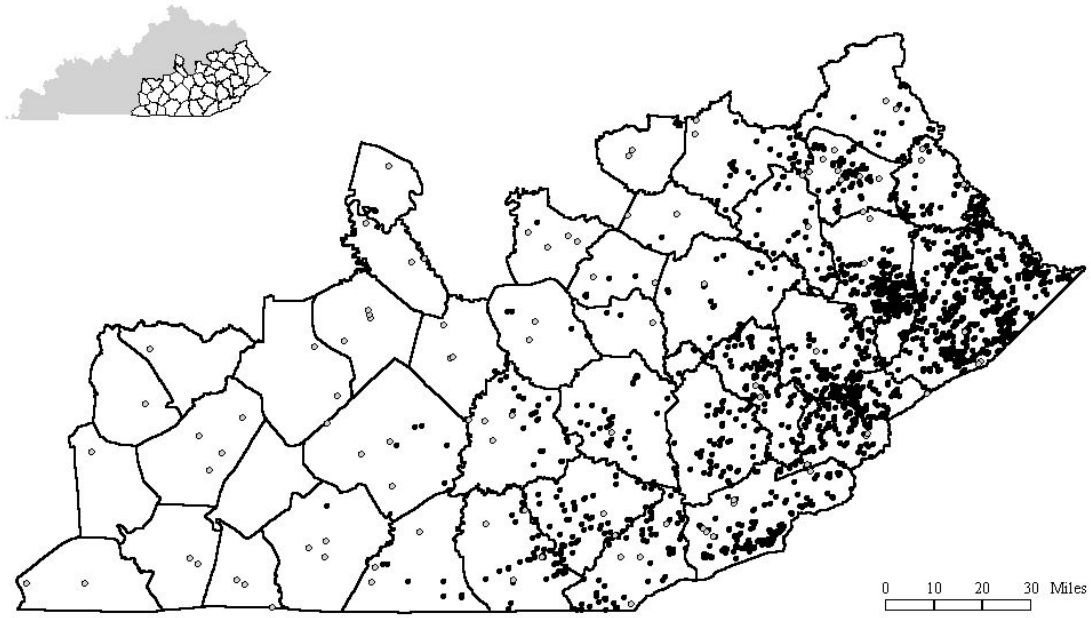



Figure 2.6 Mining Operations in the PRIDE Region (black symbols are coal; gray symbols are other types).

Table 2.7 Mining Operations in PRIDE Region

| County | Active Coal Mines and Annual Production (1998)* | | | | | |
|---|---|---|---|---|---|---|
| | **Underground** | | **Surface** | | **Total** | |
| | **Mines** | **Tonnage** | **Mines** | **Tonnage** | **Mines** | **Tonnage** |
| Adair | | | | | | |
| Bell | 18 | 3,446,024 | 13 | 2,089,313 | 31 | 5,535,337 |
| Breathitt | | | 15 | 5,114,284 | 15 | 5,114,284 |
| Casey | | | | | | |
| Clay | 1 | 24,780 | 11 | 358,950 | 12 | 383,730 |
| Clinton | | | | | | |
| Cumberland | | | | | | |
| Estill | | | | | | |
| Floyd | 40 | 3,371,872 | 8 | 3,549,131 | 48 | 6,921,003 |
| Garrard | | | | | | |
| Green | | | | | | |
| Harlan | 42 | 7,030,822 | 19 | 1,863,585 | 61 | 8,894,407 |
| Jackson | | | 1 | 1000 | 1 | 1000 |
| Jessamine | | | | | | |
| Johnson | 3 | 1,122,515 | 6 | 161,327 | 9 | 1,283,842 |
| Knott | 34 | 5,323,122 | 23 | 5,708,165 | 57 | 11,031,287 |
| Knox | 16 | 456,128 | 9 | 192,765 | 25 | 648,893 |
| Laurel | | | | | | |
| Lawrence | 2 | 238,340 | 4 | 162,482 | 6 | 400,822 |
| Lee | | | | | | |
| Leslie | 9 | 7,543,274 | 5 | 1,797,234 | 14 | 9,340,508 |
| Letcher | 23 | 7,272,864 | 32 | 3,654,936 | 55 | 10,927,800 |
| Lincoln | | | | | | |
| Magoffin | | | 2 | 819,070 | 2 | 819,070 |
| Martin | 27 | 5,932,925 | 17 | 6,328,104 | 44 | 12,261,029 |
| McCreary | | | | | | |
| Menifee | | | | | | |
| Metcalfe | | | | | | |
| Monroe | | | | | | |
| Morgan | | | | | | |
| Owsley | | | 3 | 50,429 | 3 | 50,429 |
| Perry | 18 | 5,652,935 | 21 | 6,035,671 | 39 | 11,688,606 |
| Pike | 100 | 22,567,221 | 131 | 12,929,025 | 231 | 35,496,246 |
| Pulaski | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Rockcastle | | | | | | |
| Russell | | | | | | |
| Taylor | | | | | | |
| Wayne | | | | | | |
| Whitley | 2 | 83,373 | 7 | 159,168 | 9 | 242,541 |
| Wolfe | | | | | | |
| Totals | 335 | 70,066,195 | 327 | 50,974,639 | 662 | 121,040,834 |

*Source: Annual Report of The Department Of Mines And Minerals, Commonwealth of Kentucky for the Year Ending December 31, 1998. (http://www.caer.uky.edu/kdmm/)

## 2.8 Environmental Impact Assessment

In an attempt to identify potential environmental problems within the PRIDE region, a general assessment formula was developed that seeks to quantify the magnitude of environmental impacts on a county basis. Such a tool can be used to help allocate resources to address specific problems and to help target locations for additional water quality monitoring.

In generating a score for each county, different problem indicators were summed, normalized and weighted to obtain a single score for each area. The final score was based on a combination of observed impacts and potential impacts. Observed impacts were quantified on the basis of the number of miles within a county that did not meet their designated use (i.e. Table 1.3). The potential impacts were based on: 1) estimated number of straight pipes/failing septic systems, 2) total estimated design capacity of package plants, 3) total design effluent capacity of all permitted wastewater treatment facilities, 4) number of illegal dumps, and 5) number of mines. In the absence of any specific ranking criteria, each potential impact was assumed to have an equal weight. The environmental impact score for each county was determined using the following formula:

ESCORE = 0.5*MILE + 0.1*SPFS + 0.1*QPP + 0.1*QSTP + 0.1*DUMP + 0.1*MINE

Where:ESCORE = environmental impact score (0-1)
MILE = the number of miles of impacted streams per county/MMILE
MMILE = the maximum number of impacted miles in any one county
SPFS = number of straight pipes-failing septic systems per county/MNSF
MNSF = maximum number of straight pipes-failing septic per county in region
QPP = total capacity of package plants per county/MQPP
MQPP = maximum capacity of package plants per county in region
QSTP = total wastewater treatment plant effluent per county/MWWTP
MWWTP = maximum capacity of wastewater plants per county in region
DUMP = number of illegal dumps/MDUMPS
MDUMPS = maximum number of dumps per county in region
MINE = number of permitted mines per county/MMINES
MMINES = maximum number of mines per county in region

Using the above equation, potential impact scores were developed for each county in the region. A rank of the counties by score is shown in Table 2.8 and visualized in Figure 2.7. It should be emphasized that the final score represents a relative measure of potential problems and not necessarily an absolute one since the magnitude of a particular impact (e.g. dumps, mines, etc.) may be influenced by factors not explicitly considered (i.e. size of the facility, proximity to a stream, frequency and magnitude of discharge violations, etc.). Nevertheless, the score does provide some measure of comparison between counties on the basis of the selected indicators.

## Table 2.8 Potential Environmental Impact Scores (Ranked by County)

| COUNTY | MILE | SPFS | QPP | QSTP | DUMP | MINE | ESCORE | ERANK |
|---|---|---|---|---|---|---|---|---|
| HARLAN | 1 | 1 | 0.58 | 0.29 | 0.32 | 0.23 | 1 | 1 |
| PIKE | 0.75 | 0.8 | 1 | 0.28 | 0.46 | 1 | 0.98 | 2 |
| FLOYD | 0.82 | 0.61 | 0.36 | 0.17 | 0.15 | 0.4 | 0.78 | 3 |
| PERRY | 0.85 | 0.18 | 0.2 | 0.37 | 0.25 | 0.19 | 0.73 | 4 |
| LETCHER | 0.82 | 0.42 | 0.03 | 0.19 | 0.27 | 0.35 | 0.72 | 5 |
| BELL | 0.55 | 0.18 | 0.18 | 0.41 | 0.17 | 0.11 | 0.51 | 6 |
| LAUREL | 0.36 | 0.24 | 0.15 | 1 | 0.13 | 0.04 | 0.45 | 7 |
| KNOTT | 0.44 | 0.05 | 0.31 | 0.03 | 0.23 | 0.2 | 0.4 | 8 |
| LESLIE | 0.51 | 0.04 | 0.05 | 0.01 | 0.23 | 0.09 | 0.4 | 9 |
| MCCREARY | 0.46 | 0.03 | 0.27 | 0.02 | 0.08 | 0.02 | 0.37 | 10 |
| MAGOFFIN | 0.31 | 0.58 | 0.01 | 0.04 | 0.45 | 0.05 | 0.36 | 11 |
| JOHNSON | 0.22 | 0.7 | 0.36 | 0.12 | 0.13 | 0.12 | 0.34 | 12 |
| BREATHITT | 0.34 | 0.04 | 0 | 0.09 | 0.2 | 0.05 | 0.28 | 13 |
| WHITLEY | 0.09 | 0.2 | 0.39 | 0.09 | 0.79 | 0.08 | 0.27 | 14 |
| LAWRENCE | 0.25 | 0.07 | 0.07 | 0.13 | 0.2 | 0.04 | 0.24 | 15 |
| MARTIN | 0.2 | 0.37 | 0.14 | 0.03 | 0.03 | 0.08 | 0.22 | 16 |
| WOLFE | 0.28 | 0.01 | 0.02 | 0.01 | 0.14 | 0.01 | 0.21 | 17 |
| GARRARD | 0.25 | 0.07 | 0.03 | 0.12 | 0.1 | 0.01 | 0.21 | 18 |
| JESSAMINE | 0.2 | 0.18 | 0.01 | 0.12 | 0.05 | 0 | 0.19 | 19 |
| CLAY | 0.05 | 0.33 | 0.24 | 0.09 | 0.32 | 0.06 | 0.17 | 20 |
| MORGAN | 0.11 | 0.5 | 0.01 | 0.07 | 0.03 | 0.05 | 0.16 | 21 |
| WAYNE | 0 | 0.02 | 0.06 | 0.08 | 1 | 0.01 | 0.16 | 22 |
| JACKSON | 0.09 | 0.22 | 0.1 | 0.02 | 0.3 | 0.01 | 0.15 | 23 |
| KNOX | 0.05 | 0.16 | 0.01 | 0.12 | 0.44 | 0.1 | 0.15 | 24 |
| PULASKI | 0.06 | 0.05 | 0.06 | 0.35 | 0.25 | 0.02 | 0.14 | 25 |
| ROCKCASTLE | 0.14 | 0.1 | 0 | 0.07 | 0.2 | 0.01 | 0.14 | 26 |
| TAYLOR | 0.03 | 0.01 | 0.21 | 0.49 | 0.04 | 0 | 0.12 | 27 |
| CUMBERLAND | 0 | 0.02 | 0.18 | 0.06 | 0.51 | 0.01 | 0.1 | 28 |
| ESTILL | 0.03 | 0.04 | 0.05 | 0.1 | 0.21 | 0.01 | 0.08 | 29 |
| RUSSELL | 0 | 0.03 | 0.01 | 0.42 | 0.11 | 0 | 0.08 | 30 |
| LINCOLN | 0.03 | 0.04 | 0.01 | 0.11 | 0.14 | 0.01 | 0.06 | 31 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| MENIFEE | 0.01 | 0.26 | 0.04 | 0.02 | 0.03 | 0 | 0.05 | 32 |
| OWSLEY | 0.02 | 0.03 | 0.01 | 0.05 | 0.14 | 0.01 | 0.04 | 33 |
| CLINTON | 0.01 | 0.01 | 0.02 | 0.05 | 0.18 | 0.01 | 0.04 | 34 |
| CASEY | 0 | 0.02 | 0 | 0.08 | 0.19 | 0 | 0.04 | 35 |
| ADAIR | 0 | 0.02 | 0.05 | 0.1 | 0.09 | 0.01 | 0.04 | 36 |
| GREEN | 0 | 0.01 | 0 | 0.1 | 0.1 | 0 | 0.03 | 37 |
| LEE | 0 | 0 | 0.02 | 0.04 | 0.16 | 0.01 | 0.03 | 38 |
| MONROE | 0 | 0 | 0 | 0.09 | 0.08 | 0.01 | 0.02 | 39 |
| METCALFE | 0 | 0.01 | 0 | 0.06 | 0.09 | 0 | 0.02 | 40 |

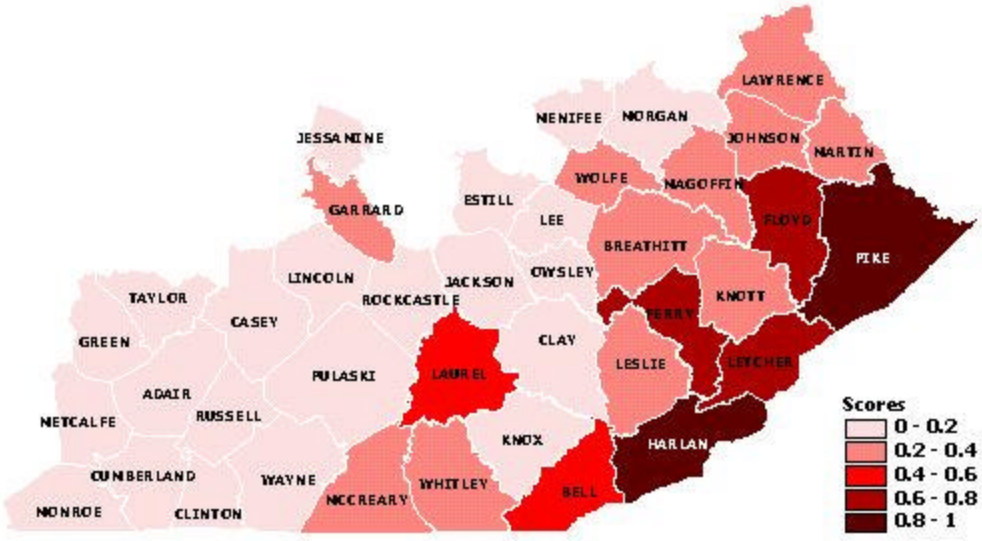



Figure 2.7 County Environmental Impact Score

# ENVIRONMENTAL PROGRAMS

Several environmental programs have been implemented in the PRIDE 40 county region over the last several years. These include various PRIDE programs as well as targeted state and federal programs. A brief overview of these programs is provided in the following sections.

## 3.1 PRIDE Programs

The PRIDE initiative was announced by U.S. Congressman Hal Rogers and Kentucky Natural Resources and Environmental Protection Cabinet Secretary James Bickford in 1997. PRIDE is the first comprehensive, region-wide, local/state/federal cooperative effort designed to address the serious challenge of cleaning up Kentucky's rivers and streams of sewage and garbage, ending illegal trash dumps and promoting environmental awareness and educational programs. Each county and community in the 40-county PRIDE region has been requested to designate a PRIDE Coordinator. This person works directly with the PRIDE Office to help organize cleanup activities and other PRIDE initiatives and assist local officials with the PRIDE programs and application process. In addition, the counties are in the process of establishing PRIDE Committees. The committees will assist the local PRIDE Coordinators with PRIDE programs and activities.

Since 1997, PRIDE and PRIDE-related projects have received almost $70,000,000 in federal funding authorization and the PRIDE program itself has received $26,000,000 in funding through the U.S. Department of Commerce and the National Oceanic Atmospheric Administration (NOAA): 1) the Community Grant Program, 3) the Education Program, and 3) the Revolving Loan Program

### 3.1.1 Community Grant Program

This program provides grants of up to $20,000 for local cleanup activities, appliance buy-back programs, recycling efforts, certain equipment purchases and other projects dealing with environmental restoration and rehabilitation. These grants are awarded twice a year (spring and fall) to city and county governments, environmental advocacy groups, civic and community organizations and other non-profit entities. The grant requires a 25% local match of either in-kind or cash resources. The program was established in November of 1998 and has released over $2,700,000 in grant funds. Cumulative Community Grants per County are summarized in Table 3.1. In addition to support of other community based activities, this program has been used to support the cleanup of 430 illegal dumps during the last two years (see Figure 3.1).

### 3.1.2 Education Program

This program provides funds to educational institutions and environmental education organizations for environmental education projects. These grants of up to $5,000 are available for activities including outdoor classrooms, recycling programs, curriculum materials and other environmental education outlets. The program was established in November of 1998 and has released over $520,000 in grant funds. Cumulative Education Grants by County are shown in Table 3.2.

Through the PRIDE Environmental Education Grants and the new PRIDE Environmental Education Video, "Kids Can Make a Difference", PRIDE has made a substantial commitment to providing resources for increasing the environmental literacy and awareness across the region. This program has also been used to support several volunteer water quality sampling efforts across the region.

### 3.1.3 Septic System Loan Program

This $5,750,000 loan fund assists homeowners and communities with sewage treatment and disposal problems. This program provides low-interest loans for individuals to purchase and install septic tanks or other wastewater treatment/disposal systems. Loans are also available for sewage line tap-on fees. Applications are available through the PRIDE Office or the local Area Development District Office. Cumulative loans by county are provided in Table 3.3. A map showing the location of the revolving loan sites is provided in Figures 3.2.

### 3.1.4 PRIDE Program Assessment

In an attempt to assess the spatial distribution of PRIDE funds, a summary table of total PRIDE expenditures per county is shown in Table 3.4 and Figure 3.5.

Table 3.1 Summary of Community Grants by County

| County | Award | Dumps Cleaned | Trash Removed (tons) |
|---|---|---|---|
| Floyd | $351,515.00 | 7 | 146.4 |
| Harlan | $261,777.00 | 53 | 688.8 |
| Pulaski | $239,522.00 | 15 | 575.9 |
| Whitley | $197,736.00 | 14 | 274.2 |
| Knott | $165,000.00 | 8 | 35.4 |
| Jackson | $140,000.00 | 11 | 636.4 |
| Leslie | $125,925.00 | 5 | 311.0 |
| Lawrence | $116,347.00 | 14 | 330.0 |
| Johnson | $108,491.00 | 18 | 18.7 |
| Clay | $105,000.00 | 22 | 624.8 |
| Pike | $102,000.00 | 154 | 2894.8 |
| Breathitt | $101,985.00 | 8 | 3305.8 |
| Martin | $98,000.00 | 12 | 134.1 |
| Perry | $90,000.00 | 4 | 1304.4 |
| Wayne | $89,625.00 | 17 | 97.1 |
| Menifee | $80,000.00 | 25 | 685.5 |
| Monroe | $77,790.00 | 3 | 132.9 |
| Russell | $77,125.00 | 28 | 212.4 |
| Lee | $72,808.00 | 5 | 10.2 |
| Letcher | $66,700.00 | 1 | 87.0 |
| Adair | $63,750.00 | 17 | 268.9 |
| Wolfe | $63,450.00 | 8 | 425.5 |
| Magoffin | $60,000.00 | - | - |
| Lincoln | $58,600.00 | 7 | 92.9 |
| Rockcastle | $57,000.00 | 9 | 19.3 |
| Morgan | $55,000.00 | 12 | 200.8 |
| McCreary | $50,000.00 | 13 | 28.1 |
| Owsley | $50,000.00 | 5 | 63.7 |
| Laurel | $47,497.00 | 12 | 91.0 |
| Taylor | $45,000.00 | 10 | 54.8 |
| Bell | $40,000.00 | 5 | 343.6 |
| Knox | $38,000.00 | - | 110.0 |
| Metcalfe | $35,000.00 | 11 | 12.1 |
| Cumberland | $31,000.00 | 10 | 1.4 |
| Green | $30,000.00 | 12 | 105.5 |
| Casey | $27,542.00 | 2 | 8.8 |
| Estill | $20,000.00 | 12 | 2047.8 |
| Jessamine | $20,000.00 | 43 | 944.2 |
| Garrard | $10,000.00 | 2 | 454.0 |
| Clinton | $0.00 | - | - |

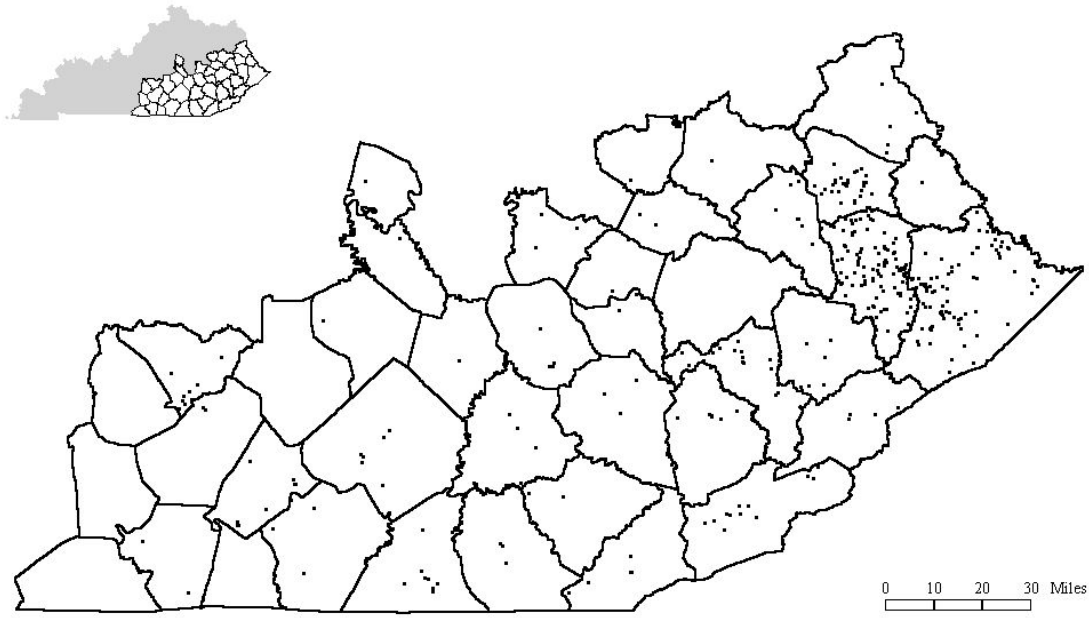



Figure 3.1 Illegal Dumps Cleaned Up.

Table 3.2 Summary of Septic System Loans By County

| County | Number of loans | Value of Loans |
|---|---|---|
| Wayne | 278 | $700,392.00 |
| Harlan | 245 | $498,503.00 |
| Leslie | 197 | $464,160.00 |
| Perry | 177 | $315,520.00 |
| McCreary | 133 | $397,728.00 |
| Morgan | 127 | $344,805.00 |
| Knox | 152 | $351,786.00 |
| Knott | 130 | $308,638.00 |
| Johnson | 109 | $357,008.00 |
| Whitley | 105 | $298,789.00 |
| Pike | 98 | $315,520.00 |
| Menifee | 126 | $326,939.00 |
| Lincoln | 67 | $239,317.00 |
| Bell | 97 | $234,153.00 |
| Breathitt | 76 | $204,092.00 |
| Lawrence | 67 | $239,317.00 |
| Martin | 78 | $223,212.00 |
| Pulaski | 80 | $212,439.00 |
| Rockcastle | 35 | $77,548.00 |
| Floyd | 69 | $223,702.00 |
| Clinton | 77 | $174,983.00 |
| Casey | 78 | $211,424.00 |
| Wolfe | 60 | $170,260.00 |
| Garrard | 44 | $179,272.00 |
| Letcher | 44 | $105,852.00 |
| Adair | 53 | $170,781.00 |
| Jessamine | 40 | $179,196.00 |
| Russell | 78 | $166,302.00 |
| Magoffin | 51 | $143,636.00 |
| Jackson | 31 | $70,080.00 |
| Laurel | 40 | $112,860.00 |
| Clay | 58 | $100,132.00 |
| Estill | 41 | $111,459.00 |
| Lee | 36 | $97,622.00 |
| Cumberland | 25 | $65,461.00 |
| Monroe | 14 | $30,442.00 |
| Metcalfe | 26 | $72,788.00 |
| Owsley | 18 | $43,698.00 |
| Green | 15 | $28,209.00 |
| Taylor | 5 | $11,495.00 |

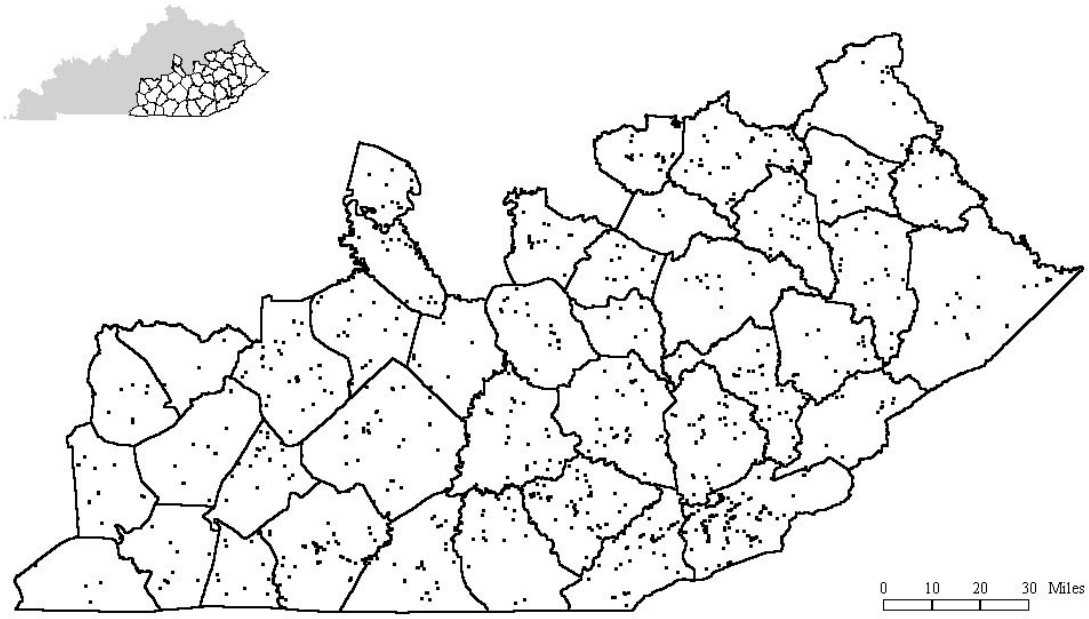



Figure 3.2 Locations of Septic System Loans.

Table 3.3 Summary of Educational Grants by County

| County | E. Grants |
|---|---|
| Perry | $55,752 |
| Harlan | $57,754 |
| Clay | $42,432 |
| Whitley | $74,680 |
| Floyd | $65,291 |
| Leslie | $59,768 |
| Bell | $38,575 |
| Letcher | $19,237 |
| Martin | $4,000 |
| Pike | $63,570 |
| Pulaski | $67,294 |
| Wayne | $39,350 |
| Lawrence | $18,325 |
| Lincoln | $12,035 |
| Jackson | $31,185 |
| Adair | $169,950 |
| Lee | $4,800 |
| Johnson | $35,526 |
| Casey | $18,540 |
| Morgan | $52,267 |
| Knott | $31,565 |
| Knox | $41,435 |
| McCreary | $8,975 |
| Menifee | $15,939 |
| Breathitt | $36,000 |
| Rockcastle | $16,540 |
| Wolfe | $21,450 |
| Magoffin | $27,094 |
| Russell | $13,450 |
| Estill | $80,312 |
| Garrard | $17,420 |
| Clinton | $13,061 |
| Owsley | $15,910 |
| Laurel | $77,640 |
| Jessamine | $23,186 |
| Monroe | $14,285 |
| Green | $4,200 |
| Cumberland | $10,520 |
| Taylor | |
| Metcalfe | |

Table 3.4 Total PRIDE Expenditures by County

| County | ERANK | Community Grants | Educational Grants | Septic System Loans | Total Pride Grants/Loans |
|---|---|---|---|---|---|
| Harlan | 1 | $556,877 | $57,754 | $498,503 | $1,113,134 |
| Wayne | 21 | $184,120 | $39,350 | $700,392 | $923,862 |
| Whitley | 10 | $448,889 | $74,680 | $298,789 | $822,358 |
| Perry | 3 | $227,750 | $55,752 | $535,627 | $819,129 |
| Leslie | 28 | $225,925 | $59,768 | $464,160 | $749,853 |
| Floyd | 13 | $385,710 | $65,291 | $223,702 | $674,703 |
| Johnson | 14 | $233,491 | $35,526 | $357,008 | $626,025 |
| Morgan | 17 | $223,550 | $52,267 | $344,805 | $620,622 |
| Pike | 4 | $231,250 | $63,570 | $315,520 | $610,340 |
| Knott | 16 | $245,000 | $31,565 | $308,638 | $585,203 |
| Pulaski | 24 | $291,756 | $67,294 | $212,439 | $571,489 |
| Menifee | 35 | $173,000 | $15,939 | $326,939 | $515,878 |
| Lawrence | 6 | $249,847 | $18,325 | $239,317 | $507,489 |
| McCreary | 15 | $81,000 | $8,975 | $414,223 | $504,198 |
| Knox | 8 | $88,000 | $41,435 | $351,786 | $481,221 |
| Lincoln | 26 | $125,900 | $12,035 | $342,465 | $480,400 |
| Breathitt | 2 | $231,485 | $36,000 | $204,092 | $471,577 |
| Bell | 5 | $54,808 | $38,575 | $327,536 | $420,919 |
| Lee | 18 | $260,008 | $4,800 | $105,951 | $370,759 |
| Martin | 20 | $138,500 | $4,000 | $223,212 | $365,712 |
| Adair | 34 | $23,599 | $169,950 | $170,781 | $364,330 |
| Wolfe | 25 | $168,750 | $21,450 | $170,260 | $360,460 |
| Clay | 9 | $195,000 | $42,432 | $100,132 | $337,564 |
| Jackson | 32 | $232,000 | $31,185 | $70,080 | $333,265 |
| Magoffin | 11 | $154,500 | $27,094 | $143,636 | $325,230 |
| Rockcastle | 19 | $164,400 | $16,540 | $77,548 | $258,488 |
| Russell | 31 | $78,375 | $13,450 | $166,302 | $258,127 |
| Casey | 37 | $18,540 | $18,540 | $211,424 | $248,504 |
| Estill | 29 | $46,750 | $80,312 | $111,459 | $238,521 |
| Letcher | 7 | $96,700 | $19,237 | $117,187 | $233,124 |
| Garrard | 30 | $25,620 | $17,420 | $179,272 | $222,312 |
| Jessamine | 22 | $16,410 | $23,186 | $179,196 | $218,792 |
| Owsley | 33 | $143,640 | $15,910 | $43,698 | $203,248 |
| Laurel | 12 | | $77,640 | $112,860 | $190,500 |
| Clinton | 38 | | $13,061 | $174,983 | $188,044 |
| Green | 36 | $132,450 | $4,200 | $28,209 | $164,859 |
| Cumberland | 23 | $72,600 | $10,520 | $65,461 | $148,581 |
| Monroe | 39 | $100,245 | $14,285 | $30,442 | $144,972 |
| Taylor | 27 | $132,500 | | $11,495 | $143,995 |
| Metcalfe | 40 | $61,050 | | $72,788 | $133,838 |

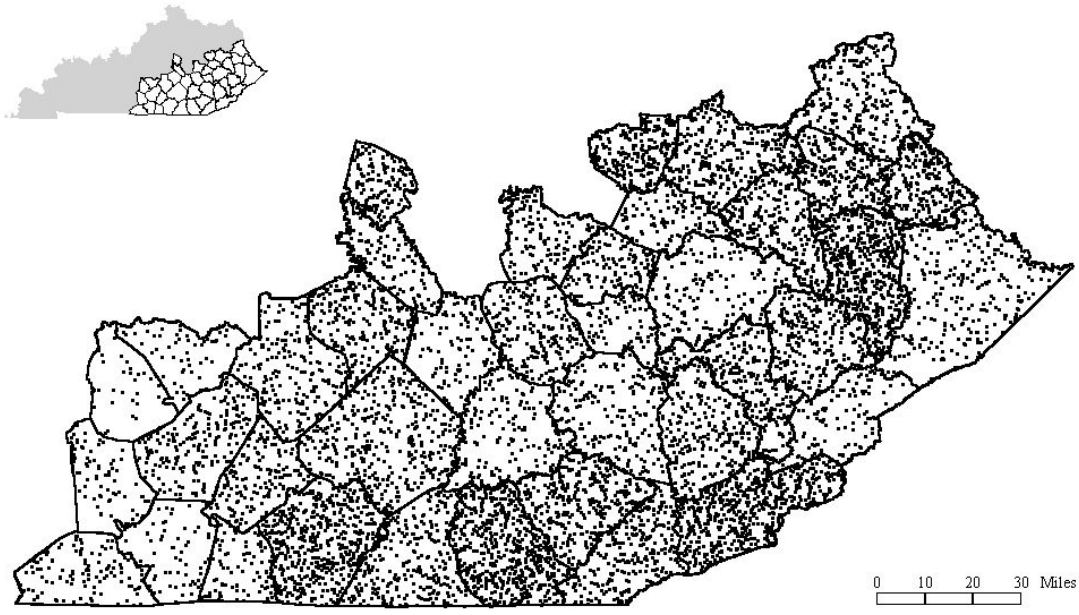



Figure 3.3 Total PRIDE Expenditures by County (each dot represents $1,000; positions of dots are arbitrary).

## 3.2 Federal Programs

In addition to the various PRIDE programs, PRIDE also works with the US Army Corps of Engineers and the US Environmental Protection Agency to help coordinate the CORPS 531 Program, and various EPA Water Quality Earmarks that have been authorized in the PRIDE region. Each of these programs are discussed in the following sections.

### 3.2.1 CORPS 531 Program

Section 531 of the 1996 Water Resources Development Act authorizes a program whereby the U.S. Army Corps of Engineers can provide design and construction assistance for water related environmental infrastructure projects in Eastern and Southern Kentucky. These projects must address wastewater, water supply and surface water resource and related problems. All projects are cost shared at 75 percent Federal and 25 percent non-Federal from the local sponsor. Areas eligible for assistance include Bell, Breathitt, Clay, Floyd, Harlan, Jackson, Johnson, Knott, Knox, Lawrence, Laurel, Lee, Leslie, Letcher, Magoffin, Martin, McCreary, Neniffee, Morgan, Owsley, Perry, Pike, Pulaski, Rockcastle, Wayne, Whitley, and Wolfe counties. Within the areas listed above, those eligible to apply are any public entity that is capable of financing the project and providing for operation and maintenance of the project once completed. This may include cities, counties, or public service districts.

This U.S. Army Corps of Engineers program offers grants to communities, counties and other public entities for wastewater treatment projects that include traditional sewage treatment facilities and innovative wastewater treatment methods such as wetlands, sand filtration systems, cluster holding systems and others. To date, the Corps has awarded a total of $8,180,000 for 19 projects in the 5th Congressional District. A list of the projects is provided in Table 3.5 and shown in Figure 3.4.

### 3.2.2 EPA Earmarks

The mission of the U.S. Environmental Protection Agency is to protect human health and to safeguard the natural environment - air, water, and land - upon which life depends. Funding for numerous water quality projects in the PRIDE counties has been included in EPA appropriations bills. These projects include extensions of wastewater collection lines and upgrades or expansions of existing wastewater treatment plants to better serve the local communities. To date, EPA has authorized $8,000,000 for 209 projects in the 40 county PRIDE region. A list of the projects is provided in Table 3.6 and shown in Figure 3.5.

### 3.2.3 Federal Programs Assessment

In an attempt to assess the spatial distribution of all federal funds across the region, a summary table of PRIDE, COE, and EPA federal authorizations per county is shown in Table 3.7 and Figure 3.6.

Table 3.5. PRIDE Region COE Water Quality Projects

| Program | Year | County | Location | Project Costs |
|---|---|---|---|---|
| 202 | 1999 | Martin | Lovely | $99,800 |
| 531 | 1999 | Bell | Middlesborough | $258,225 |
| 531 | 1998 | Breathitt | Caney Creek | $374,000 |
| 531 | 1998 | Floyd | Prestonsburg | $230,750 |
| 531 | 1998 | Floyd | City of Allen | $266,000 |
| 531 | 1998 | Floyd | David | $510,000 |
| 531 | 1999 | Harlan | Evarts | $200,000 |
| 531 | 1999 | Johnson | Greentown | $247,500 |
| 531 | 1999 | Laurel | Corbin | $61,050 |
| 531 | 1999 | Letcher | Letcher | $287,300 |
| 531 | 1999 | Letcher | Jenkins | $287,000 |
| 531 | 1998 | Letcher | Millstone | $376,000 |
| 531 | 1998 | Letcher | Whitesburg | $500,000 |
| 531 | 1999 | Magoffin | Royalton | $732,600 |
| 531 | 1998 | Menifee | Means | $200,000 |
| 531 | 1998 | Pike | Elkhorn City | $480,000 |
| 531/EPA | 1999 | Pulaski | Burnside | $1,100,000 |
| 531 | 1999 | Pike | S. Williamson | $880,000 |
| 531 | 2000 | Johnson | Paintsville | $204,250 |
| 531 | 2000 | Jackson | McKee | $200,000 |
| 531 | 2000 | Wayne | Monticello | $568,000 |

Table 3.6. PRIDE Region EPA Water Quality Projects

| Program | Year | County | Location | Project Costs |
|---|---|---|---|---|
| EPA/531 | 1998 | Pulaski | Burnside | $2,000,000 |
| EPA | 1998 | Leslie | Hyden | $1,500,000 |
| EPA | 1998 | Morgan | Morgan Co. WD | $2,000,000 |
| EPA | 1998 | Floyd | Wayland | $1,500,000 |
| EPA | 1998 | Whitney | Williamsburg | $3,000,000 |
| EPA | 1999 | Owsley | Booneville | $900,000 |
| EPA | 1999 | Letcher | Fleming Neon | $1,500,000 |
| EPA | 1999 | Johnson | Paintsville | $1,900,000 |
| EPA | 1999 | Magoffin | Salyersville | $500,000 |
| EPA | 1999 | Wolfe | Campton | $1,700,000 |
| EPA | 2000 | Jessamine | North Jessamine | $4,303,100 |
| EPA | 2000 | Knott | Hindman | $1,900,500 |
| EPA | 2000 | Pulaski | Somerset | $1,330,350 |
| EPA | 2000 | Knox | Corbin | $950,250 |
| EPA | 2000 | Harlan | Evarts | $950,250 |
| EPA | 2000 | McCreary | McCreay Co. | $950,250 |

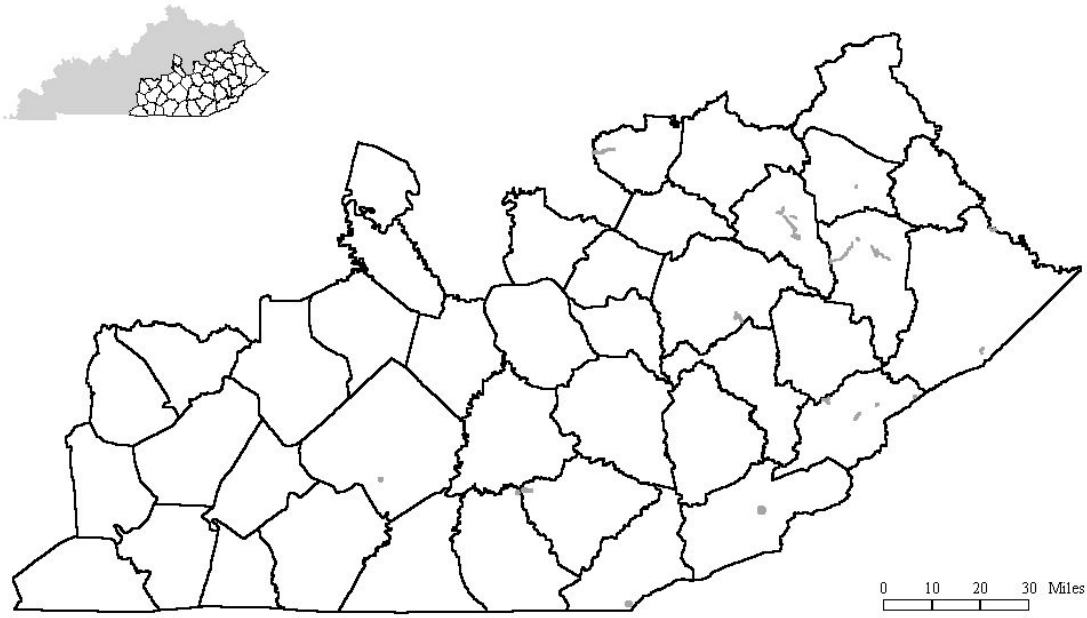



Figure 3.4 COE Water Quality Projects.

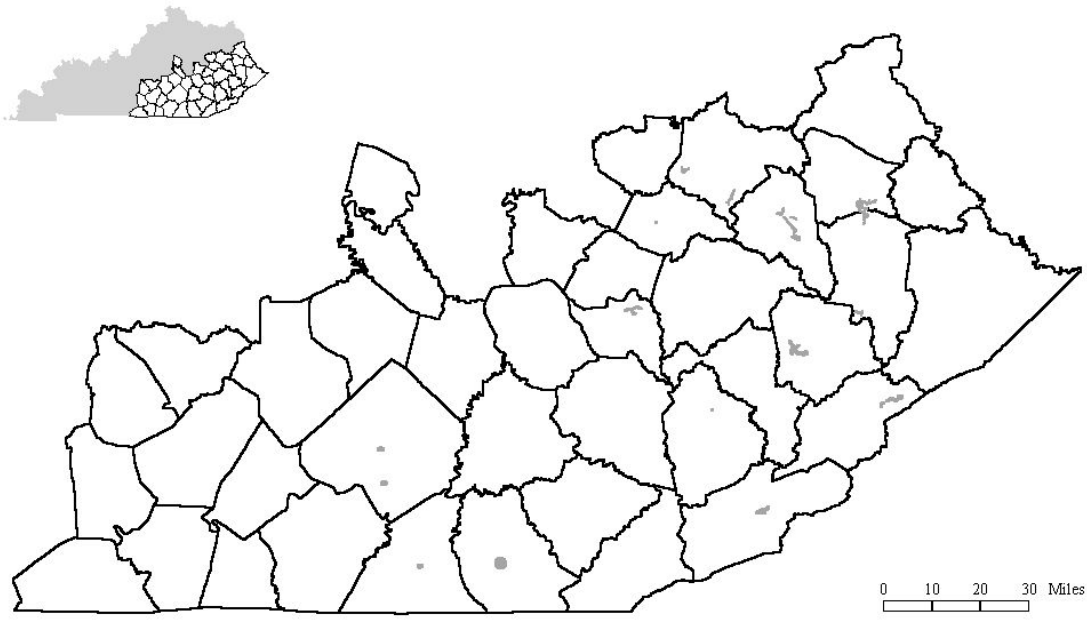



Figure 3.5 EPA Earmark Water Quality Projects.

Table 3.7 Summary of Federal Authorizations in PRIDE Region

| County | Erank | Total Pride Grants/Loans | COE | EPA | Total Federal Authorisations |
|---|---|---|---|---|---|
| Pike | 4 | $1,127,455.16 | $1,615,750.00 | $6,167,800.00 | $8,911,005.16 |
| Whitley | 10 | $1,776,920.00 | $3,250,000.00 | $3,000,000.00 | $8,026,920.00 |
| Floyd | 13 | $1,694,703.00 | $2,235,750.00 | $1,500,000.00 | $5,430,453.00 |
| Letcher | 7 | $1,386,874.00 | $2,529,000.00 | $1,500,000.00 | $5,415,874.00 |
| Pulaski | 24 | $1,193,289.00 | $856,651.00 | $3,330,350.00 | $5,380,290.00 |
| Harlan | 1 | $2,173,509.00 | $1,188,000.00 | $950,250.00 | $4,311,759.00 |
| Laurel | 12 | $219,000.47 | $1,073,750.00 | $2,500,000.00 | $3,792,750.47 |
| Perry | 3 | $2,953,501.32 | $218,250.00 | $500,000.00 | $3,671,751.32 |
| Leslie | 28 | $1,592,278.00 | $300,000.00 | $1,500,000.00 | $3,392,278.00 |
| Morgan | 17 | $672,242.00 | | $2,000,000.00 | $2,672,242.00 |
| Knott | 16 | $644,393.00 | | $1,900,500.00 | $2,544,893.00 |
| Clay | 9 | $2,065,289.00 | $316,500.00 | | $2,381,789.00 |
| Wolfe | 25 | $396,747.24 | | $1,700,000.00 | $2,096,747.24 |
| Bell | 5 | $1,320,514.00 | $636,750.00 | | $1,957,264.00 |
| Wayne | 21 | $949,402.00 | $1,000,500.00 | | $1,949,902.00 |
| Martin | 20 | $1,377,062.00 | $414,800.00 | | $1,791,862.00 |
| McCreary | 15 | $518,447.00 | | $950,250.00 | $1,468,697.00 |
| Knox | 8 | $499,442.00 | | $950,250.00 | $1,449,692.00 |
| Owsley | 33 | $222,098.00 | $296,250.00 | $900,000.00 | $1,418,348.00 |
| Magoffin | 11 | $342,907.00 | $495,000.00 | $500,000.00 | $1,337,907.00 |
| Johnson | 14 | $636,595.00 | $519,000.00 | | $1,155,595.00 |
| Lawrence | 6 | $1,017,789.00 | | | $1,017,789.00 |
| Adair | 34 | $862,880.00 | | | $862,880.00 |
| Lincoln | 26 | $806,839.00 | | | $806,839.00 |
| Lee | 18 | $802,659.22 | | | $802,659.22 |
| Menifee | 35 | $515,878.00 | $267,750.00 | | $783,628.00 |
| Breathitt | 2 | $514,986.35 | $75,000.00 | | $589,986.35 |
| Casey | 37 | $548,504.00 | | | $548,504.00 |
| Jackson | 32 | $405,360.74 | $123,750.00 | | $529,110.74 |
| Rockcastle | 19 | $409,503.78 | | | $409,503.78 |
| Russell | 31 | $270,982.00 | | | $270,982.00 |
| Estill | 29 | $253,678.00 | | | $253,678.00 |
| Garrard | 30 | $242,812.00 | | | $242,812.00 |
| Clinton | 38 | $226,632.00 | | | $226,632.00 |
| Jessamine | 22 | $218,792.00 | | | $218,792.00 |
| Monroe | 39 | $197,176.73 | | | $197,176.73 |
| Green | 36 | $175,959.00 | | | $175,959.00 |
| Cumberland | 23 | $168,331.00 | | | $168,331.00 |
| Taylor | 27 | $143,995.00 | | | $143,995.00 |
| Metcalfe | 40 | $133,838.00 | | | $133,838.00 |

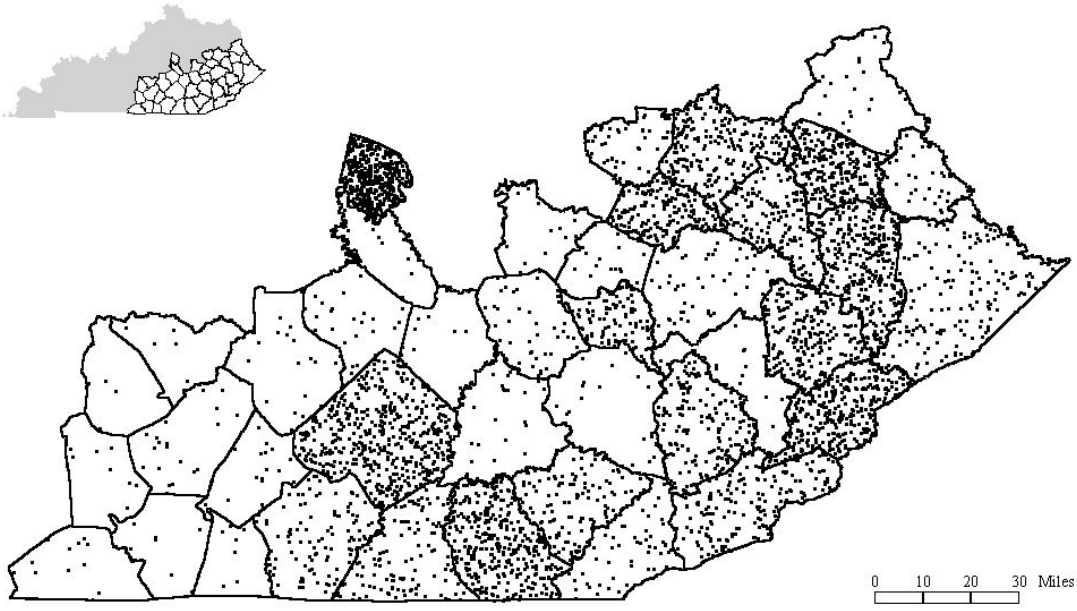



Figure 3.6 Total Federal Authorizations by County (each dot represents $10,000; positions of dots are arbitrary).

## 3.3 Statewide Programs

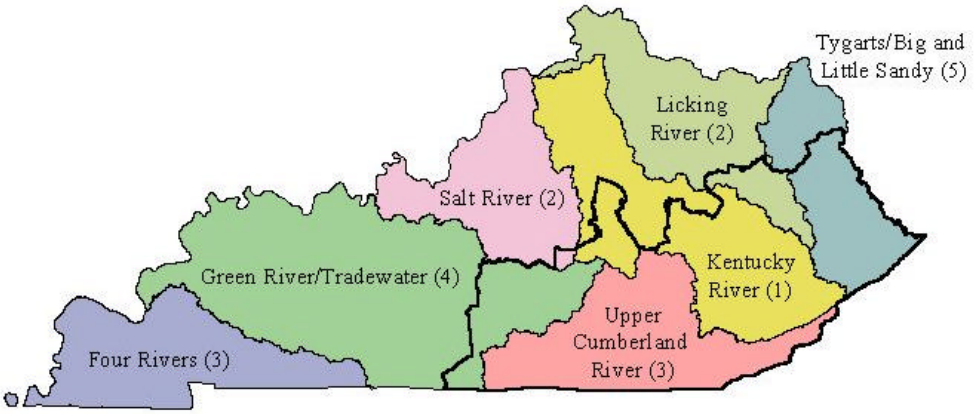
### 3.3.1 Kentucky Watershed Management Program

At about the same time as the PRIDE initiative, the state of Kentucky embarked on the development and implementation of a comprehensive Kentucky Watershed Management Framework Initiative (KWMFI) for use in managing and preserving the water resources and aquatic habitat of Kentucky. This was part of a national EPA initiative directed towards meeting the same goals for the entire country. The purpose of the framework is to provide a means for coordinating and integrating the programs, tools, and ecological structure and function of watersheds as well as support the sustainable uses of watersheds. This approach provides a framework, in time and place, within which participating individuals can link and support one another's efforts in watershed management. The initiative includes a five-year cycle of activities that proceeds from information-gathering and monitoring, assessment, prioritization of watersheds, plan development, to implementation. This schedule allows for better coordination and provides opportunities for leveraging of resources.

In contrast to a strict regulatory approach, the framework employs a resource-centered approach. Success is being measured in terms of maintaining and improving environmental quality and protecting public health by fostering the protection and restoration of specific resource areas, such as drinking water supplies, aquatic and wild life habitat propagation, and recreation, while sustaining economic activities that depend on natural resources (KWMF, 1997). The new framework is similar to programs being implemented in several states and provides a basis for investigating several different technical and sociological hypotheses related to watershed management.

For geographic coordination, the state is divided into five basin management units. Activities within each unit will follow the five-year schedule; however, the activities of each basin unit will be staggered by one year, so that efforts in a particular phase of the cycle can be better focused in a watershed. A map of the watershed management units for the PRIDE region are shown in Figure 3.7.

The ultimate objective of the program is the development and implementation of watershed management plans. The watershed management units are based on 11-digit hydrologic unit codes (HUCs), within which are nested 14-digit HUCs (sub-watersheds). HUCs were developed by the U.S. Geological Survey (USGS), the U.S. Department of Agriculture's Natural Resources Conservation Service, and others, to standardize hydrologic unit delineations for geographic description and data storage purposes.



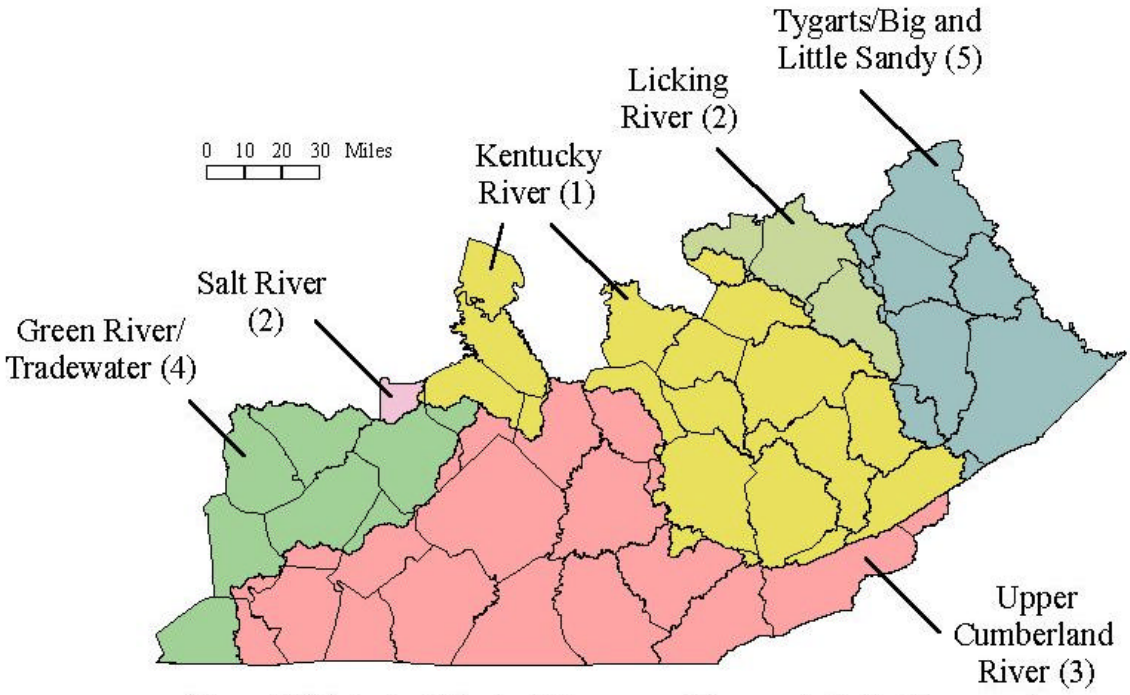




Figure 3.7 Kentucky Watershed Management Framework Basin Management Units Statewide and in the PRIDE Region (numerals indicate sequence of five-year basin management cycle).

### 3.3.2 Kentucky TMDL Program

Kentucky's TMDL program has been developed to meet the requirements of Section 303(d) of the Clean Water Act. The TMDL program is designed to establish the Total Maximum Daily Load (TMDL) of a particular constituent that a stream may receive without violating the associated water quality standard. Where the existing load exceeds the TMDL, the state is required to develop a load reduction and allocation strategy that will meet the TMDL requirement. The schedule for conducting TMDLs is based upon Kentucky's Watershed Management Framework approach. Waterbodies are prioritized based upon the type, extent, and intensity of impairment. Waterbodies within Kentucky for the most part share similar uses. They are assessed for support of warm water aquatic habitat and primary and secondary contact recreation criteria by default. Furthermore, a waterbody is assessed for drinking water use if a drinking water intake exists in that waterbody. All waterbodies listed as "not supporting" are given first priority in TMDL development for their particular basin. All "partial support" waterbodies are given a second priority ranking. Waters are further prioritized within each river basin management unit factoring in the use impaired, risk, and extent of public concern. Discussions of each of these TMDLs is provided in the following sections.

**3.3.2.1 North Fork Kentucky River, Southeastern Kentucky.** A map of the North Fork Kentucky River is shown in Figure 3.8. This project was originally described in the 1992 303(d) list because of a swimming advisory on its entire 163-mile length. A phased TMDL for the North Fork was approved by U.S. EPA in January 1995.

The Kentucky Division of Water initiated a water quality investigation in May 1987 to identify the sources of fecal coliform bacteria in the North Fork of the Kentucky River at Jackson (Beck, 1994). Ambient monitoring at that time indicated unacceptable (>400/100ml) fecal coliform levels for primary contact recreation (i.e. swimming) at 53 percent of the 34 sampling stations. The city of Jackson had broken sewer lines and an improperly operating lift station which resulted in the bypassing of untreated sewage to the North Fork Kentucky River. The wastewater treatment plant was also found to be discharging sludge (concentrated sewage) to the river. The city of Jackson agreed to make necessary repairs. However, subsequent monitoring continued to indicate unacceptable fecal coliform levels during the primary contact recreation season (May 1 through October 1).

In May 1990, an extensive survey of the North Fork was conducted from Whitesburg to Beattyville (approximately 154 miles). This sampling effort included 37 stations and found that discharges from the cities of Jackson, Hazard, Hindman, and Whitesburg were all out of compliance. Numerous straight pipe discharges and a bypassing lift station at Jackson were also noted during the sampling. A swimming advisory was posted for the North Fork Kentucky River due to the unacceptable effluent and instream fecal coliform levels.

A holistic watershed monitoring approach was initiated in 1992 in an effort to achieve the goal of less than 400 fecal coliform/100 ml (the level needed to lift the swimming ban).

Ten main stem stations and four municipal effluents were monitored during the primary contact recreation season. Permitted dischargers were warned by letter that noncompliance with their permit limits would result in fines. Each facility was sampled three times and instream fecal coliform levels declined to the extent that approximately one-half (80 miles) of the swimming advisory was lifted in July 1993. However, fecal pollution levels continued to be unacceptable for swimming from below Hazard to above Whitesburg as a result of numerous illegal straight pipe discharges of untreated waste from private homes.

Continued sampling through 1997 (Beck, 1997) indicated a general decrease in fecal pollution with the exception of the station on the North Fork above Hazard. The municipal discharges of Jackson, Hazard (one violation in six samples), Whitesburg, Fleming-Neon, and Vicco were in compliance. Compliance testing at package plants also led to improvements in water quality. Of 51 plants initially tested in 1992, 22 (43%) failed to meet the daily permit limit of 400 fecal coliforms/100 ml. By 1997, the percent of permit violations had dropped to 10% during the May sampling event and 17% during the September sampling.

Fecal coliform data from sampling during the 1998 primary contact recreation season showed that the geometric mean for all stations on the North Fork decreased with the exception of the station at Chavies. However, the data indicated that a swimming advisory was still necessary from above Whitesburg to below Hazard. Of the seven monthly municipal effluent samples taken, only the Whitesburg wastewater treatment plant failed to meet the daily permit on two occasions and the Hazard and Jackson effluents each failed on one occasion. Of 31 package treatment plants effluents sampled in during the 1998 primary contact recreation season, 10 (32%) did not meet their daily limit during at least one sampling event and two facilities failed on both samples. This was somewhat higher than indicated by the 1997 sampling (24% overall failure).

Data collected in October 1999 (Beck, 1999) indicated the best water quality since the swimming advisory was initially put into effect. In addition, geometric means for primary contact recreation seasons from 1990 though 1999 at five stations (above Whitesburg, below Whitesburg, above Hazard, Below Hazard, and at Chaives) indicated a general reduction of fecal pollution at each station (above Whitesburg was approximately the same as 1998) over the period. The 1999 samples were taken during drought conditions which were not representative of normal runoff conditions. However, the municipal fecal coliform results indicated that Fleming-Neon, Vicco, Whitesburg, Hazard, and Jackson effluents were all meeting the daily permit limit for fecal coliform.

**3.3.2.2 Upper Cumberland River Basin.** A map of the Upper Cumberland River TMDL study area is shown in Figure 3.9. This watershed area was listed as a high priority because of prevalent bacteria problems that resulted in swimming advisories in 1994. Areas listed were 13 miles of the Cumberland River, 25 miles of the Poor Fork below Harlan, and 3 miles of Looney Creek.

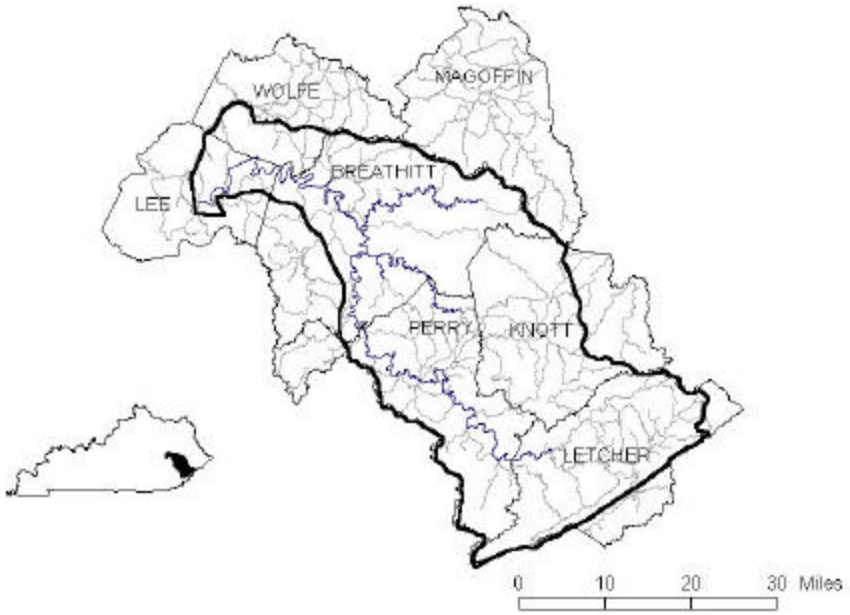



Figure 3.8 North Fork of the Kentucky River TMDL Study Area (State Roads in Gray)

A water quality investigation was begun in 1993 by the Kentucky Division of Water to identify sources of fecal coliform bacteria in the upper Cumberland River drainage (Beck, 1998). Samples were collected in July and August from 55 stations. Nine municipal effluents were included in the survey. As a result of the initial intensive survey, monthly sampling was continued at selected stations during the 1994 through 1999 primary contact recreation seasons (May through October of each year).

The 1993 fecal coliform analyses indicated that the main stem was safe for primary contact recreation with the exception of the headwater communities of Pineville, Harlan, and Loyal. Fifty-three percent (23 of 43) of the tributary stations sampled had unacceptable fecal coliform levels. Six of the nine municipal discharges exceeded their KPDES permit limit for fecal coliforms on one or more occasions. The wastewater effluents of Williamsburg, Pineville, and Evarts indicated little or no treatment. Fecal pollution in the main stem was predominantly originating from four sources: (1) the Pineville wastewater treatment plant, (2) the Loyall wastewater treatment plant, (3) the city of Harlan, and (4) tributaries in the headwaters of the upper Cumberland mainstem. A press release was distributed in October warning of the swimming health risk.

In June 1994, five samples were collected within a 30-day period at 16 locations in the drainage basin. Because results indicated unacceptable levels for primary contact recreation, approximately 98 miles of the stream were place under a swimming advisory.

Monthly samples were collected during the six months of the primary contact recreation season in 1995. Sampling included seven mainstem stations, 14 tributary stations, and seven municipal wastewater treatment plants. Results continued to show unacceptable fecal coliform levels (83 of 115 stream samples (approximately 72%) had concentrations greater than 400/100ml). Compliance sampling inspections at 22 package treatment plants indicated that 12 (approximately 55%) did not meet their KPDES effluent standards in September and 7 (approximately 27%) did not meet the standards in October. Three municipal demand letters were issued (Harlan, Loyall, and Benham).

Fecal coliform samples were again collected during the six month primary contact recreation season in 1996 at seven mainstem stations, 14 tributary stations, and seven municipal wastewater treatment plant effluents. One hundred of the 132 stream samples collected (approximately 76%) had unacceptable fecal coliform levels. Three of 20 package plants failed to meet standards in June and two did not meet the standard in October. Nine package plant discharges were eliminated. Seven were connected to municipal plants, one ceased operation and discharge, and one was replaced by a septic tank and lateral field. In addition, a large straight pipe from the community of Rio Vista was connected to the Loyall wastewater treatment plant and two combined sewer overflows were eliminated by the city of Harlan.

Monthly fecal coliform samples were collected during the six month primary contact recreation season in 1997. The results supported continuing the swimming advisory. Seventeen demand letters and one agreed order were issued to 11 package wastewater

treatment plants and five municipalities (Evarts, Loyall, Harlan, Cumberland, and Lynch).

Continued sampling in Bell and Harlan Counties during 1998 and 1999 (Beck, 2000) indicated that numerous tributary streams still exceeded the coliform standard and two wastewater treatment plants exceeded the standard during at least one of the sampling events each year (Loyall and Evarts). In addition, six package plants exceeded effluent standards on at least one sample.

### 3.3.3 Clean Water Action Plan

In February 1998, the President released his Clean Water Action Plan with the broad vision of watershed restoration and protection through cooperative approaches. The purpose of the program is to identify priority restoration watersheds in each state and then to develop detailed restoration action plans. All action plan strategies follow a basic plan path: information gathering or monitoring, TMDL development, targeting of pollutant sources, identification of remediation options, and implementation. The Kentucky Division of Water and the USDA Natural Resources Conservation Service (NRCS) were the lead agencies in developing a Unified Watershed Assessment for Kentucky. Additionally, the Kentucky Department of Fish and Wildlife Resources and the U.S. Fish and Wildlife Service were asked to provide input on their priority watershed for the prioritization process.

The NRCS will track the agricultural land-treatment measures and completed resource-management systems through its performance measurement system. This will be accomplished quarterly. The Kentucky Interagency Watershed Monitoring Workgroup will monitor in-stream water quality improvements following implementation. Priority watersheds will be funded beginning in 1999 through existing programs subject to fund availability and as supported by local work groups. Existing programs to be utilized and leveraged with Clean Water Action Plan funds are:

USDA Environmental Quality Incentives Program
USDA Wetland Reserve Program
USDA Wildlife Habitat Incentives Program
USDA Conservation Reserve Program
Section 319(h) Non-point Source Grants
Division of Conservation State Cost Share Program
Direct Aid to Conservation Districts
Equipment Revolving Loan Fund
Wastewater State Revolving Loan Fund
Drinking Water State Revolving Loan Fund for land acquisition
Personal Responsibility In A Desirable Environment (PRIDE) Grants and Loans

Of the five watersheds selected for Kentucky in 1998, two of the watersheds (i.e. Rock Creek and Upper Cumberland) are located within the PRIDE region while a third watershed (The Dix River) is located partially within the PRIDE region (see Figure 3.10).

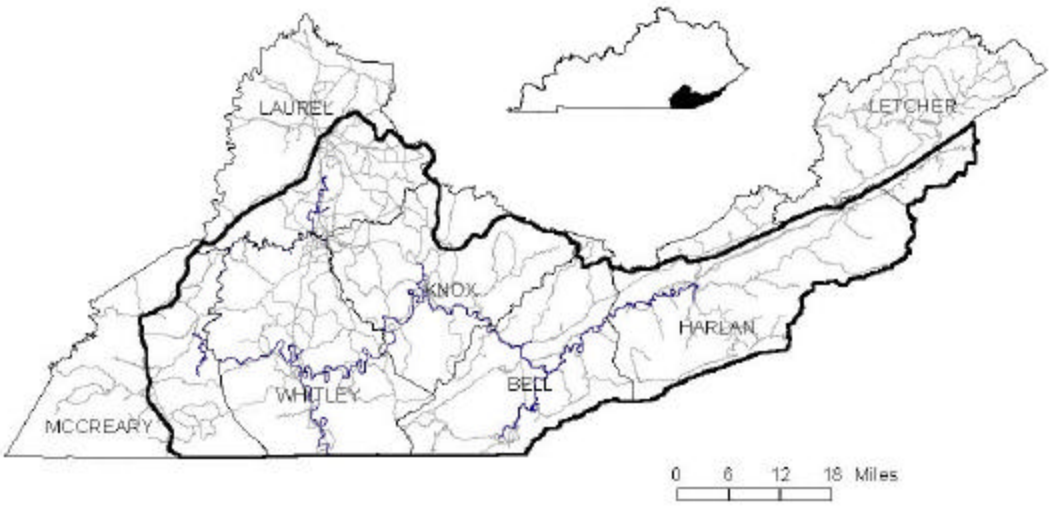



Figure 3.9 Upper Cumberland River TMDL Study Area (State Roads in Gray)

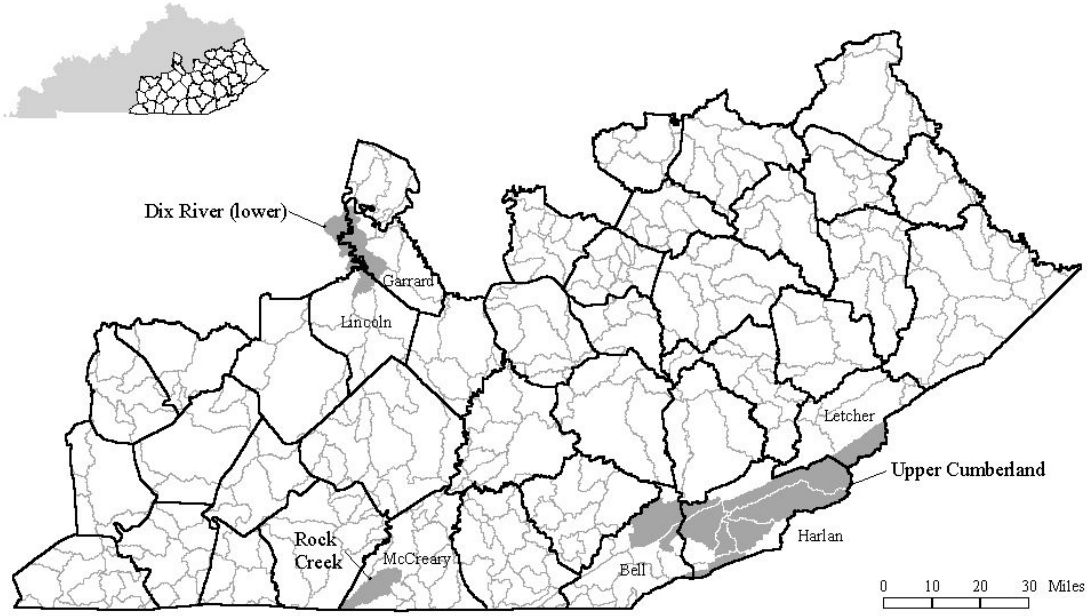



Figure 3.10 CWAP Watersheds Located in the PRIDE Region.

**3.3.3.1. Rock Creek.** The Office of Surface Mining is leading the Clean Streams Initiative in the Appalachian Mountain area. This initiative focuses on coordinating the efforts and funding of the various agencies and programs that are addressing the cleanup and prevention of acid mine drainage. A diverse multi-agency Rock Creek Task Force has been assembled and is in the process of obtaining funds for the assessment of impacts and identification of feasible solutions to the acid mine drainage problems in the watershed.

These efforts have already laid the groundwork for much coordination, monitoring, and planning for future implementation. Solutions to acid mine drainage will be expensive. Practices may include anoxic and oxic limestone drains, wetland polishing cells, detention basins, addition of limestone sand as stream bed material, and other practices that have shown success in Appalachian states.

The Rural Abandoned Mine Program (RAMP) has been a major program tool to reclaim abandoned mined lands in Kentucky from 1978 to 1995. NRCS currently has thirty-five active contracts which exhausts the funds available through RAMP. Although RAMP has not been funded since 1995, locally led processes are currently in progress to fund the program in future years. Provided RAMP funds are made available in the future, water quality problems caused by resource extraction can be significantly reduced.

**3.3.3.2. Upper Cumberland.** Additional field reconnaissance and planning will be required to determine the nature and extent of wastewater problems in the Upper Cumberland. The distribution and number of straight pipes and failing septic systems will determine whether or not individuals can (1) be connected to existing wastewater collection systems or (2) receive sewer extensions to existing sewer collection systems or (3) whether on-site wastewater systems will suffice. Soils, geology, topography, costs, and economic status of residents will all dictate the types of on-site systems to be utilized.

Also, education and citizen involvement will be key components. The public will have to be made aware that the problem exists and that pathogen-contaminated streams pose a real health threat. Once this awareness has been raised, the public should begin to accept the financial and maintenance burden that goes with on-site systems. Public understanding and acceptance will be key to success in these communities.

### 3.3.4 Kentucky 319 Program

Section 319 Non-point Source Projects are funded through the 319 Non-point Source Program. The KDOW serves as the lead agency for this program, which involves the input and cooperation of numerous federal, state, local, and university organizations. For fiscal year 2000 over $3.2 million was received from the U.S. EPA for 319 projects, which include education, technical assistance, watershed projects, demonstration projects, financial assistance, training, and/or enforcement. Section 319(h) grant funds will continue to be targeted to 303(d)-listed waters for non-point source pollution control activities.

### 3.3.5 Agriculture Programs

**3.3.5.1 Agriculture Water Quality Act.** The Agriculture Water Quality Act was passed by the Kentucky General Assembly in 1994. The main goal of the Act is to protect surface and groundwater resources from pollution resulting from agriculture and silviculture activities and help restore waters that currently fail to meet designated uses. Many of the impaired waters in Kentucky experience problems from agricultural run-off. The Agriculture Water Quality Act requires all landusers with 10 or more acres to develop and implement a farm water quality plan based upon guidance from a Statewide Water Quality Plan. This statewide plan provides guidance to landusers on protecting the water resources in Kentucky. Technical assistance is available during the development and implementation of individual farm plans. Financial assistance may also be available. Landusers must select applicable BMPs to be included in their individual plan from the Statewide Water Quality Plan. Landusers will have until October 2001 to put the BMPs in place.

**3.3.5.2 EQIP Program.** The USDA Environmental Quality Incentives Program (EQIP) was developed in 1996 to target federal funds for agricultural related conservation measures. Under EQIP, the USDA can provide cost-share assistance to family-sized farms and ranches for up to 75 percent of the costs of certain environmental practices, such as grassed waterways, filter strips, manure management facilities, capping abandoned wells, and wildlife enhancement.

EQIP assistance is provided primarily to state priority areas. Each state's priority areas are determined locally and then approved by the NRCS state conservationist, in conjunction with state technical committees and USDA Farm Service personnel. Under EQIP, priority areas are watersheds, or geographic regions, with (1) special environmental sensitivity, such as important wetland areas, or (2) significant natural resource concerns, such as manure management, soil erosion control, and water quality. High priority EQIP watersheds within the 40 county PRIDE region for 1999 and 2000 are shown in Figure 3.11.

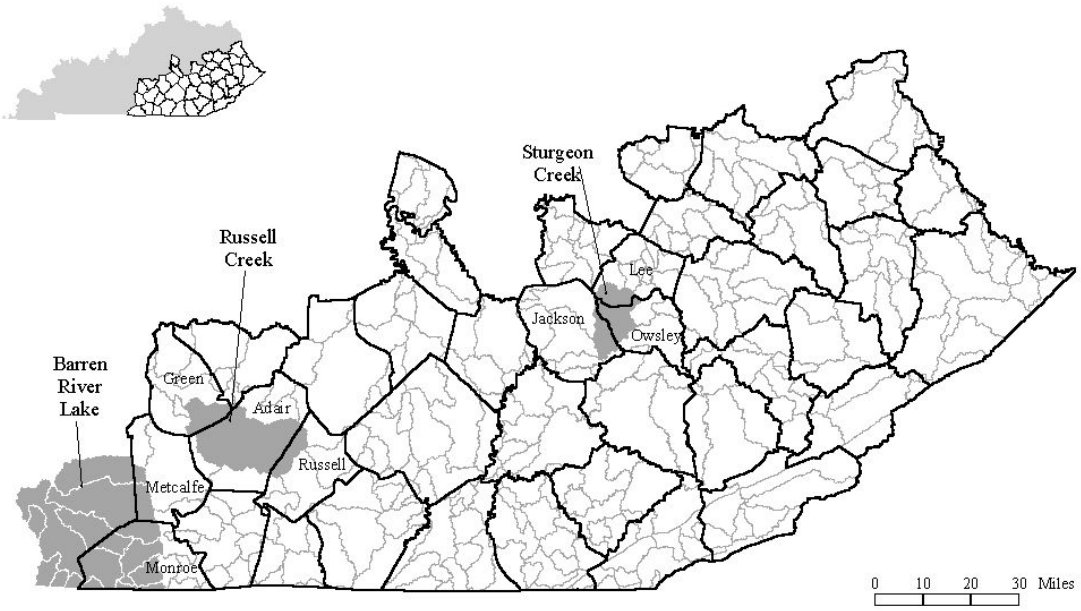



Figure 3.11 High-Priority EQIP Watersheds Located in the PRIDE Region.

### 3.3.6 Conservation Programs

The Kentucky Division of Conservation under the Natural Resources Department administers two program that provide funds to support conservation and environmental restoration efforts in the PRIDE region. Each of the programs are described below:

**3.3.6.1 Direct Aid Program.** Direct aid funds are appropriated by the legislature to be made available to conservation districts for purposes approved by the commission including operating their offices, hiring clerical help and conservation field aides, paying district supervisors per diem, and purchasing office equipment. Direct aid is distributed to districts through base level funding to each district and grant funding based on requests submitted by conservation districts to the division. A total of $1,150,00.00 was appropriated for the Direct Aid program for the state of Kentucky for 2000. A breakdown of allocations for each PRIDE county is provided in Table 3.9.

**3.3.6.2 Soil Erosion and Water Quality Cost Share Program.** The State Cost Share Program provides financial assistance to individuals to implement Best management Practices on farms or in forest operations to improve water quality. Any person engaged in agricultural or silvicultural operations is eligible to apply through the local conservation district, which oversees the installation of Best Management Practices. A total of $11,150,000.00 was appropriated for the Soil Erosion and Water Quality Cost Share Program for the state of Kentucky for 2000. This includes $9,000,000.00 from the Federal Tobacco Settlement Phase I. A breakdown of general conservation grants and environmental grants for each PRIDE county is provided in Table 3.10.

### 3.3.7 Wastewater Programs

3.3.7.1 201 Wastewater Facilities Planning. The Federal Water Pollution Control Act of 1972 (P.L. 92-500), as subsequently amended and commonly known as the Clean Water Act, requires that states be actively involved in wastewater planning. Section 303(e) requires the state to be involved in the continuous planning for maintaining and improving the quality of all its navigable waters. This is achieved through river basin planning which involves the compilation and analysis of water quality data for each of Kentucky's ten primary rivers. In order for a community or regional area to receive federal funding for specific waste treatment facilities, a 201 plan must be submitted in accordance with the guidelines set forth under Section 201 of the Clean Water Act. A map of the 201 planning areas that are located within the PRIDE region is provided in Figure 3.12.

**3.3.7.2 State Revolving Fund.** Kentucky's state revolving fund for municipal wastewater treatment facilities has been a key element in initiating various construction projects to resolve existing point source problems and provide additional treatment capacity. Since the fund began making commitments in 1989, 97 projects totaling more than $216.8 million have been funded as of January 1, 1998. This program is responsible for administrating the 20 million dollars in EPA earmarks that have been authorized in the PRIDE region.

3.3.6.3 **State Water Resource Development Plan.** In 1996, Governor Paul Patton executed Executive Order 96-1339 which directed the Kentucky Water Resources Development Commission to prepare a strategic plan for water resource development in Kentucky. The goal of the plan is to provide the best available water and sewer service to every Kentuckian by the year 2020. In March 2000, the WRDC produced a draft report entitled: Water Resource Development: A Strategic Plan for Wastewater Treatment. The report determined that between 5.5 to 9 billion dollars will be needed to improve and maintain Kentucky's public wastewater treatment infrastructure for the period 2000-2020. This estimate is based on locally identified needs of 2 billion dollars to expand, upgrade, and replace public sewer infrastructure, and an additional 3.5 to 7 billion to bring onsite wastewater systems into compliance. A map of existing wastewater systems within the 40 county PRIDE region along with proposed expansion areas is provided in Figure 3.13. Identified infrastructure needs for the 40 county PRIDE region are listed by county in Table 3.11.

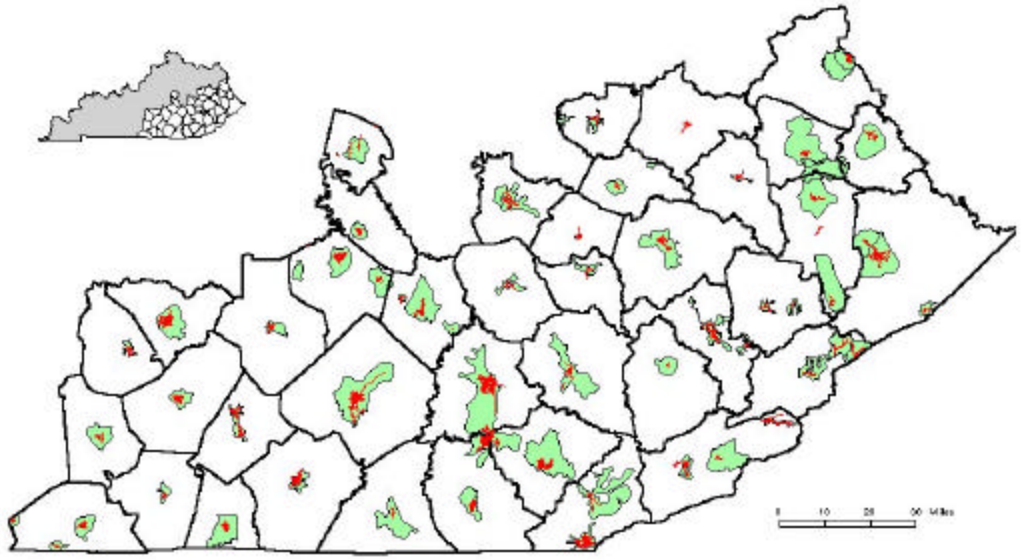


Figure 3.12 Map of 201 Facility Planning Areas with Existing Sewer Lines in the PRIDE Region

Table 3.9 Direct Aid Funds by County

| County | Base Funding | Grant Funding | Total |
|---|---|---|---|
| Adair | $ 4,000.00 | $ 9,172.80 | $ 13,172.80 |
| Bell | $ 4,000.00 | $ 9,000.00 | $ 13,000.00 |
| Breathitt | $ 4,000.00 | | $ 4,000.00 |
| Casey | $ 4,000.00 | $ 14,167.50 | $ 18,167.50 |
| Clay | $ 4,000.00 | | $ 4,000.00 |
| Clinton | $ 4,000.00 | | $ 4,000.00 |
| Cumberland | $ 4,000.00 | $ 18,720.00 | $ 22,720.00 |
| Estill | $ 4,000.00 | $ 10,000.00 | $ 14,000.00 |
| Floyd | $ 4,000.00 | $ 17,900.00 | $ 21,900.00 |
| Garrard | $ 4,000.00 | $ 5,500.00 | $ 9,500.00 |
| Green | $ 4,000.00 | $ 14,172.80 | $ 18,172.80 |
| Harlan | $ 4,000.00 | | $ 4,000.00 |
| Jackson | $ 4,000.00 | $ 3,800.00 | $ 7,800.00 |
| Jessamine | $ 4,000.00 | $ 30,000.00 | $ 34,000.00 |
| Johnson | $ 4,000.00 | $ 6,064.00 | $ 10,064.00 |
| Knott | $ 4,000.00 | $ 19,612.50 | $ 23,612.50 |
| Knox | $ 4,000.00 | | $ 4,000.00 |
| Laurel | $ 4,000.00 | $ 10,920.00 | $ 14,920.00 |
| Lawrence | $ 4,000.00 | $ 17,550.00 | $ 21,550.00 |
| Lee | $ 4,000.00 | $ 4,800.00 | $ 8,800.00 |
| Leslie | $ 4,000.00 | $ 11,163.00 | $ 15,163.00 |
| Letcher | $ 4,000.00 | $ 14,238.81 | $ 18,238.81 |
| Lincoln | $ 4,000.00 | $ 8,927.00 | $ 12,927.00 |
| Magoffin | $ 4,000.00 | $ 46,961.00 | $ 50,961.00 |
| Martin | $ 4,000.00 | $ 22,240.00 | $ 26,240.00 |
| McCreary | $ 4,000.00 | $ 6,000.00 | $ 10,000.00 |
| Menifee | $ 4,000.00 | $ 24,765.00 | $ 28,765.00 |
| Metcalfe | $ 4,000.00 | $ 4,003.00 | $ 8,003.00 |
| Monroe | $ 4,000.00 | $ 9,902.00 | $ 13,902.00 |
| Morgan | $ 4,000.00 | $ 7,124.00 | $ 11,124.00 |
| Owsley | $ 4,000.00 | $ 7,900.00 | $ 11,900.00 |
| Perry | $ 4,000.00 | $ 7,280.00 | $ 11,280.00 |
| Pike | $ 4,000.00 | $ 21,954.00 | $ 25,954.00 |
| Pulaski | $ 4,000.00 | $ 18,660.10 | $ 22,660.10 |
| Rockcastle | $ 4,000.00 | $ 5,000.00 | $ 9,000.00 |
| Russell | $ 4,000.00 | | $ 4,000.00 |
| Taylor | $ 4,000.00 | $ 1,300.00 | $ 5,300.00 |
| Wayne | $ 4,000.00 | | $ 4,000.00 |
| Whitley | $ 4,000.00 | | $ 4,000.00 |
| Wolfe | $ 4,000.00 | $ 7,000.00 | $ 11,000.00 |
| Total | $ 160,000.00 | $ 415,797.51 | $ 575,797.51 |

Table 3.10 Cost Share Funds by County

| County | Conservation Grant | Environmental Grant | Total |
|---|---|---|---|
| Adair | $ 34,690.25 | $ 5,000.00 | $ 34,690.25 |
| Bell | $ 15,256.20 | | $ 15,256.20 |
| Breathitt | | $ 10,000.00 | $ 10,000.00 |
| Casey | $ 120,804.00 | | $ 120,804.00 |
| Clay | $ 116,964.75 | | $ 116,964.75 |
| Clinton | $ 20,000.00 | | $ 20,000.00 |
| Cumberland | | | |
| Estill | | | |
| Floyd | $ 3,292.00 | | $ 3,292.00 |
| Garrard | $ 3,815.00 | | $ 8,815.00 |
| Green | $ 105,037.97 | $ 5,000.00 | $ 112,537.97 |
| Harlan | | $ 7,500.00 | $ 7,500.00 |
| Jackson | $ 355,999.00 | | $ 355,999.00 |
| Jessamine | | | |
| Johnson | $ 17,809.08 | $ 2,325.00 | $ 20,134.08 |
| Knott | | $ 7,500.00 | $ 7,500.00 |
| Knox | $ 66,502.20 | | $ 66,502.20 |
| Laurel | $ 291,976.65 | | $ 291,976.65 |
| Lawrence | $ 41,672.80 | | $ 41,672.80 |
| Lee | | $ 10,000.00 | $ 10,000.00 |
| Leslie | | $ 15,000.00 | $ 15,000.00 |
| Letcher | | $ 7,500.00 | $ 7,500.00 |
| Lincoln | $ 119,593.50 | | $ 119,593.50 |
| Magoffin | $ 18,472.25 | | $ 18,472.25 |
| Martin | $ 18,472.25 | | $ 18,472.25 |
| McCreary | | | |
| Menifee | $ 19,845.00 | | $ 19,845.00 |
| Metcalfe | $ 248,048.50 | | $ 255,548.50 |
| Monroe | $ 189,700.00 | $ 7,500.00 | $ 189,700.00 |
| Morgan | $ 224,138.27 | | $ 224,138.27 |
| Owsley | | $ 10,000.00 | $ 10,000.00 |
| Perry | | $ 10,000.00 | $ 10,000.00 |
| Pike | $ 9,819.12 | | $ 9,819.12 |
| Pulaski | $ 157,085.00 | | $ 157,085.00 |
| Rockcastle | $ 101,785.32 | | $ 101,785.32 |
| Russell | $ 84,445.05 | | $ 89,445.05 |
| Taylor | $ 43,130.00 | $ 5,000.00 | $ 43,130.00 |
| Wayne | $ 71,500.00 | | $ 71,500.00 |
| Whitley | $ 261,307.35 | | $ 261,307.35 |
| Wolfe | $ 46,518.00 | | $ 46,518.00 |
| Total | $ 2,807,679.51 | $ 102,325.00 | $ 2,912,504.51 |

Table 3.11 Detailed Infrastructure Needs by County

| County | 2000-2005 New Customers | 2000-2005 Needs ($1000) | 2006-2020 New Customers | 2006-2020 Needs ($1000) | Total ($1000) |
|---|---|---|---|---|---|
| Adair | | $1,000 | 232 | $6,500 | $7,500 |
| Bell | 149 | $5,960 | 1,670 | $38,103 | $44,063 |
| Breathitt | 290 | $2,500 | | - | $2,500 |
| Casey | | - | 143 | $1,997 | $1,997 |
| Clay | 703 | $12,982 | 865 | $28,597 | $41,579 |
| Clinton | 133 | $7,500 | 65 | $1,227 | $8,727 |
| Cumberland | | - | | - | - |
| Estill | 151 | $4,685 | 27 | $2,330 | $7,015 |
| Floyd | 3,006 | $24,900 | 4,700 | $37,600 | $62,500 |
| Garrard | 38 | $520 | 87 | $2,230 | $2,750 |
| Green | | $167 | | - | $167 |
| Harlan | | - | 5,312 | $48,990 | $48,990 |
| Jackson | 206 | $4,581 | 25 | $2,257 | $6,838 |
| Jessamine | 368 | $7,880 | 351 | $11,900 | $19,780 |
| Johnson | 1,641 | $12,300 | 312 | $8,800 | $21,100 |
| Knott | 193 | $2,000 | Prison | $10,000 | $12,000 |
| Knox | | - | 1,680 | $25,805 | $25,805 |
| Laurel | | - | 1,917 | $47,292 | $47,292 |
| Lawrence | 120 | $3,600 | | - | $3,600 |
| Lee | | - | 12 | $500 | $500 |
| Leslie | 104 | $3,600 | 200 | $2,000 | $5,600 |
| Letcher | 874 | $13,746 | 1,812 | $28,275 | $42,021 |
| Lincoln | 823 | $7,754 | 768.00 | $10,000 | $17,754 |
| Magoffin | 320 | $8,150 | 1082.00 | $10,150 | $18,300 |
| Martin | 465 | $4,600 | 517.00 | $9,400 | $14,000 |
| McCreary | 1,342 | $18,000 | 1336.00 | $16,735 | $34,735 |
| Menifee | 107 | $3,000 | 650.00 | $15,600 | $18,600 |
| Metcalfe | 30 | $335 | | - | $335 |
| Monroe | 14 | $806 | | - | $806 |
| Morgan | 120 | $2,000 | 157.00 | $6,100 | $8,100 |
| Owsley | 140 | $1,700 | 160.00 | $10,000 | $11,700 |
| Perry | 655 | $5,088 | 1115.00 | $19,260 | $24,348 |
| Pike | 3,667 | $27,800 | 6707.00 | $81,500 | $109,300 |
| Pulaski | 619 | $32,488 | 1801.00 | $14,024 | $46,512 |
| Rockcastle | | - | 806.00 | $41,389 | $41,389 |
| Russell | 321 | $4,490 | 129.00 | $1,534 | $6,024 |
| Taylor | 555 | $4,558 | 469.00 | $3,724 | $8,282 |
| Wayne | 353 | $1,651 | 34.00 | $136 | $1,787 |
| Whitley | | - | 2730.00 | $57,000 | $57,000 |
| Wolfe | 200 | $3,100 | | - | $3,100 |

## SUMMARY AND CONCLUSIONS

This report provides an overview of the water quality problems and associated state and federal programs in the 40 counties that make up the PRIDE region. The 2000 Kentucky 305(b) stream assessment has identified over 1000 miles of impaired stream within the region. The major cause of pollution in the region is related to problems with pathogens. Much of these problems are related to straight pipes and failing septic and wastewater systems. It has been estimated that there are over 35,000 straight pipes and failing septic systems in the PRIDE region. A second major environmental impact in the region is related to mining activities. However, because of the nature of the coal seams and associated strata in eastern Kentucky, most of the impacts are related to siltation and habitat alteration as opposed to pH impairment. Most of the observed pH impairment is limited to McCreary and Whitley counties as a result of the more acidic coal bearing seems that occur in these counties. A third major problem in the PRIDE counties is related to solid waste. It is estimated that there are approximately 2000 illegal dumps in the PRIDE region.

An attempt was made to identify and rank the environmental problems within the PRIDE region by county. This was done by developing a general assessment formula that included the impacts of six environmental indicators. The selected indicators include: number of miles of impacted streams, number of straight pipes-failing septic systems, total capacity of package plants, total wastewater treatment plant capacity, number of illegal dumps, and number of permitted mines. On the basis of this formula the following counties were identified as the most severely impacted: Harlan, Pike, Floyd, Perry, Letcher, Bell, Laurel, Knott, Leslie, and McCreary.

The NOAA supported PRIDE initiative includes three separate programs. These include: the community grant program, the education program, and the septic system loan program. As of July 2000, it is estimated that over 8 million dollars in funds have been allocated through these three programs. In an attempt to evaluate the funding authorizations associated with these programs, specific funding levels were compared to the overall environmental problem rank. In general, the level of funding authorizations tended to match the level of environmental problems as identified by the environmental problem indicator. The few notable exceptions included Letcher county (which had an environmental problem rank of 5 and an authorization rank of 31) and Laurel county (which had an environmental problem rank of 7 and an authorization rank of 25). Although not exact, these correlations should provide some basis for PRIDE officials to evaluate the application of PRIDE funds to problem areas.

In addition to the PRIDE programs, two other federal programs have also provided significant funding authorizations to the PRIDE region. These include the U.S. Army Corps of Engineers 531 Program, and targeted EPA earmarks. As of July 2000, it is estimated that over 35 million dollars in funds have been allocated through these two programs. Similar to the PRIDE program, an attempt was made to correlate all federal authorization (including the NOAA programs) to the environmental problem rank. In

general, these results indicated that most of the funds had been allocated to those areas with the greatest problems as measured by the environmental impact rank. However, as before some counties (i.e. Laurel and Perry) received federal allocations proportionally less than their rank while Pulaski county received federal allocations proportionally greater than their rank.

In addition to the three previously identified federal programs, this report also summarizes several Kentucky statewide environmental programs. These programs include: the Kentucky Watershed Management Program, the Kentucky TMDL program, the Kentucky Clean Water Action Plan, the Kentucky 319 program, the Kentucky Agriculture Water Quality Act, the Kentucky EQIP program, the Kentucky Division of Conservation Direct Aid Program and Water Quality Cost Share Program, the Department for Environmental Protection 201 Wastewater Facilities Planning Program and State Revolving Loan Fund, and the new State Water Resource Development Commission. All of these programs have some impact in the 40 county PRIDE region. This review should provide a basic overview and understanding of each of these programs and how they can complement the goals and objectives

The efficient utilization of federal funds in improving the water quality and aquatic habitat of the region requires a mechanism for assessing and evaluating the impacts of proposed and ongoing projects as well as some mechanism for prioritizing the allocation of additional funds. The environmental problem metric proposed in this report provides a basic way to evaluate funding priorities in light of their potential impact on targeted problems. The companion report PRIDE Water Quality Assessment Report II: Chemical, Bacteriological, Habitat and Macro-invertebrate Assessment provides a 10 year baseline assessment of environmental conditions in the region as measured by indicators of pH, fecal coliforms, habitat assessment, and macro-invertebrate assessment. This assessment should provide the basis for evaluating the long term impact of proposed and ongoing projects in the basin. Additional supplemental sampling locations for use in improving the overall project assessments are proposed in the companion report PRIDE Water Quality Assessment Report III: Existing and Proposed Monitoring Network.

## REFERENCES

Beck, Gary, 1998, Removing fecal pollution from the upper Cumberland River drainage: Water Quality Branch, Kentucky Division of Water, 54p.

Beck, Gary, 1994, Removing fecal pollution from the North Fork Kentucky River Drainage: Water Quality Branch, Kentucky Division of Water, 42 p.

Beck, Gary, 1997, North Fork Kentucky River summary: Water Quality Branch, Kentucky Division of Water, 16 p.

Beck, Gary, 1998, 1998 North Fork Kentucky River swimming advisory update and summary: Water Quality Branch, Kentucky Division of Water, 7 p.

Beck, Gary, 1999, 1999 North Fork Kentucky River Swimming Advisory Update: Water Quality Branch, Kentucky Division of Water, 11 p.

Griffin, M.S., Martin, G.R., and White, K.D., 1994, Surface-water-quality assessment of the Kentucky River Basin, Kentucky – Fixed station network and selected water-qaulity data, April 1987 through August 1991: U.S. Geological Survey Water-Resources Investigations Report 94-4029, 149 p.

Haag, K.H., and Porter, S.D., 1995, Water-quality assessment of the Kentucky River Basin, Kentucky – Nutrients, sediments and Pesticides in streams, 1987-90: U.S. Geological Survey Water-Resources Investigation Report 94-4227, 135 p.

Haag, K.H., Garcia, R., Jarrett, G.L., and Proter, S.D., 1995, Water-quality assessment of the Kentucky River Basin, Kentucky: Results of investigations of surface-water quality, 1987-90: U.S. Geological Survey.

London Regional Office, 2000, upper Cumberland River bacteriological survey data tables for 1998 and 1999: Water Quality Branch